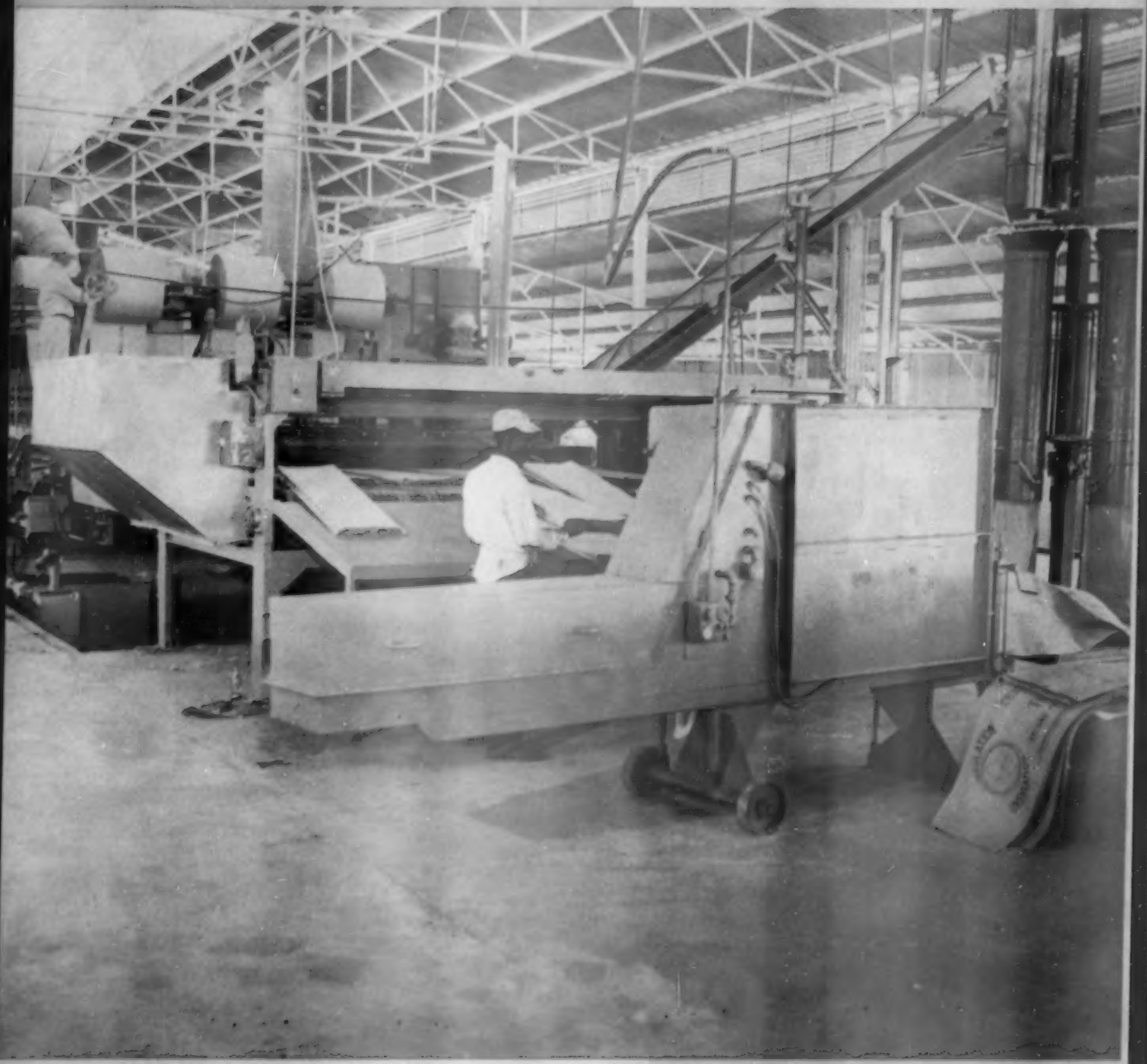
THE INDUSTRY'S RECOGNIZED AUTHORITY

ROCK PRODUCTS

LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD

Manufacturing Rock Wool By Spinning Process page 40
Two Aggregate Plants Supply Dalles Dam Project page 44
Punch Card Batching of Concrete page 131
Concrete Houses Survive Atomic Blast page 142

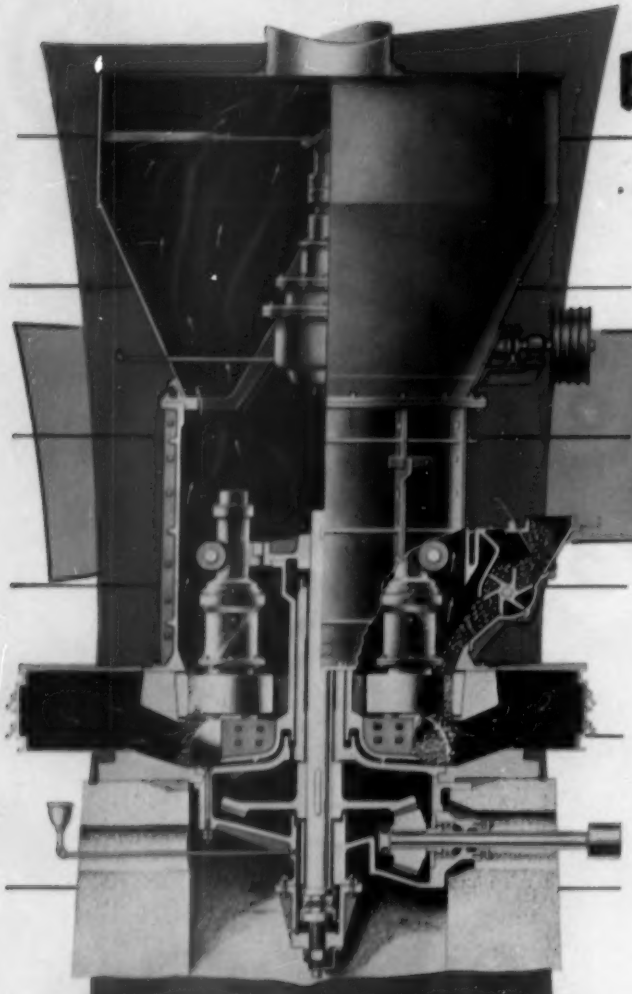


Rock wool batt production line in Texas Rockwool Corp., plant at Belton

JULY 1955

Better Fine Grinding...

...How to improve accuracy, uniformity and output at reduced cost



Cross section of Roller Mill showing how material is ground by rolls rotating against bull ring, then air swept to separator which extracts fines and returns coarse material to mill for regrinding.

WILLIAMS *Roller Mills*

Positive and continuous precision size control at exceptionally high production rates are only two of the superior features of Williams Roller Mills. Instant adjustment for grinding from 20 mesh down to 400 mesh, even to micron sizes, has established the Williams as one of the most versatile of fine grinding mills. Finished products can be maintained at finenesses of 99.9% + passing 325 mesh.

The operation of a Williams Roller Mill is simple, yet performance remains unsurpassed. Positive, self-adjusting feeding and blending of raw materials into the mill is automatic where pulverizing is done by grinding rolls spinning centrifugally against a bull ring. A continual rising current of cool air sweeps upward carrying ground material to the classifier that separates all finished fines from the coarse tailings which are all returned for further grinding.

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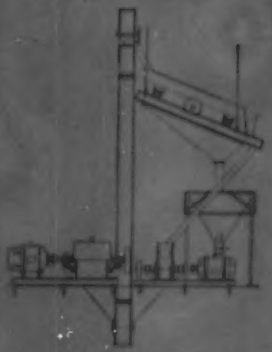

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Carried 18,000,000 tons ...26 years in a cement mill

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If your requirements demand a long-lived elevator chain, use Link-Belt SS-856. This 6-in. pitch chain is made of high carbon steel sidebars with nickel alloy pins and bushings. Its average ultimate strength is 100,000 lbs. Other Link-Belt elevator chains, with ultimate strengths up to 200,000 lbs., are also available.

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This Link-Belt SS-856 steel chain at a Pennsylvania cement mill was still serviceable after handling 18,000,000 tons of raw materials in 26 years. Those are Link-Belt cast buckets, too.

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ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY — LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD

July 1955

This Month

What's Happening 13

Editorial—Properly Designed Concrete Houses Resist Atomic Blast 23

Rocky's Notes—"Chemistry of Soil"—Perhaps of Concrete! 25

Labor Relations 27

People in the News 29

Industry News 33

Hints and Helps 36

New Machinery 38

Spinning Process for Manufacture of Rock Wool Products 40
New plant of Texas Rockwool Corp., Belton, Texas, uses spinning disc equipment for rock wool production. Pneumatic machine packs batts in bag
Bror Nordberg

The Dalles Dam—Two Aggregate Plants Supply the Materials for Big Power Project 44
Plants designed to recover fines and produce other sizes to meet deficiencies in the available local materials
Walter B. Lenhart

Flexible Plant Set-Up to Meet Specifications for Dalles Dam 46
Atkinson-Ostrander Co. produces four sizes of gravel, and uses interesting fine sand recovery equipment. Rod mills supply additional fines

Rotary Kiln—Its Performance and Development 58
Part 5: Rotary kiln segmentation and its structure
Victor J. Azbe

Industrial Sand Association Convention Honors Past Presidents 67

Increase Efficiency in Hydration of Lime 70
Part 2: Aging hydrated lime
N. V. S. Knibbs and E. G. S. Thyer

New Study on Reaction in Burning Cement Raw Materials 78
Part III: Procedure in computation of phase composition
L. A. Dahl

Vermiculite Meeting Attracts Record Attendance 88

CONCRETE PRODUCTS—

Punch Card Batching of Concrete 131
Cleveland Builders Supply Company's new electrically controlled ready mix plant designed for a variety of aggregate mixes with a capacity of 180 to 200 cu. yd. per hr.
Bror Nordberg

Compact Material Handling System for Pipe Plant 137
Hubert C. Parsons

Preventive Maintenance in the Ready-Mixed Concrete Industry 139
33: Second article of series on truck maintenance
Jas. A. Nicholson

Concrete Houses Survive Atomic Blast 142
Lightweight aggregate masonry and precast unit houses of earthquake resistant design withstood atomic shock equal to wind pressure of 720 lb. per sq. ft.
Bror Nordberg

American Concrete Agricultural Pipe Association Annual Meeting 149

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ROCK PRODUCTS is published monthly by MACLEAN-HUNTER Publishing Corporation, 309 West Jackson Blvd., Chicago 6, Illinois; Horace T. Hunter, President; P. D. Allen, Vice-President; Ralph K. Davis, Secretary. Copyright, 1955, by Maclean-Hunter Publishing Corporation. Entered as second-class matter, Jan. 30, 1936, at the Chicago, Ill., post office under the act of Mar. 3, 1879. Additional entry at Long Prairie, Minn.

ROCK PRODUCTS is indexed regularly by Engineering Index, Inc. and the Industrial Arts Index.

SUBSCRIPTION INFORMATION

Subscription Price: United States and Possessions, Canada one year, $2.00; two years, $3.00; three years, $4.00. Pan American, one year, $8.00; two years, $14.00; three years, $20.00. All other foreign one year, $12.00; two years, $22.00; three years, $30.00. Twenty-five cents for single copies. Canadian subscriptions and remittances may be sent in Canadian funds to ROCK PRODUCTS, P. O. Box 100, Terminal "A," Toronto, Canada.

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It chews up a river bed

A typical example of B. F. Goodrich improvement in rubber

BENEATH that water, there's a wonderful supply of stones, gravel and sand — all used in making concrete. They scoop them out of the river bed and into the dredge with a series of metal buckets that work like an escalator. Only one trouble.

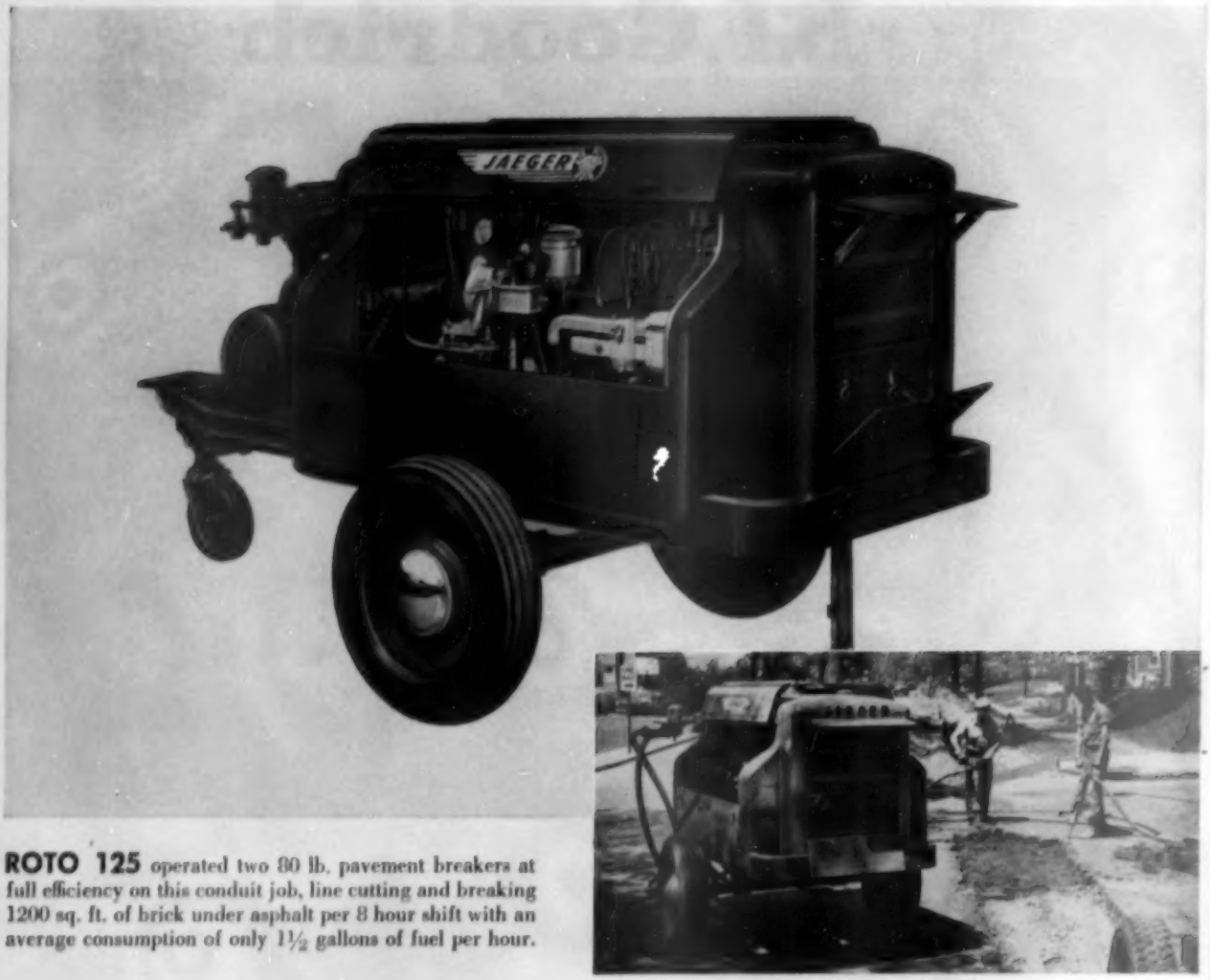
The heavy load was just too much for the rubber drive belt that keeps the buckets moving. The belt would stretch. Then everything stopped until it was shortened, fastened back together again. For years, it was the same with every belt tried. They all stretched too much, wore out too soon.

Then a B. F. Goodrich man got them to try a Highflex belt—an improved design that has better resistance to strain, practically no stretch, and many other important advantages your distributor will be glad to demonstrate. You can't see this improved B. F. Goodrich belt at work here—it's below decks. But it has been on the job seven years now—longer than any other belt used before. And it has never stretched, never needed to be shortened.

Product improvement like this is always going on at B. F. Goodrich. New ways are constantly being found to make transmission belting, conveyor belts, hose of all kinds work better, last longer. No product is ever regarded as "finished" or standardized.

How this cuts your costs: Because of these improvements and because B. F. Goodrich is one company that will *never* lower its quality standards, you can be sure of top performance and real money savings when you specify B. F. Goodrich. To find out about the latest improvements in the rubber products your company uses, call your BFG distributor or write *The B. F. Goodrich Company, Dept. M-447, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION



ROTO 125 operated two 80 lb. pavement breakers at full efficiency on this conduit job, line cutting and breaking 1200 sq. ft. of brick under asphalt per 8 hour shift with an average consumption of only 1½ gallons of fuel per hour.

Now we can announce what users have known for a year

Jaeger Roto air-plus is the first

Instant air delivery, exactly regulated to demand, maintains constant pressure as smooth as steam.

High efficiency results in slower operating speeds, the lowest fuel consumption and longest engine life of any rotary compressor.

After 5 years development work, Jaeger engineers perfected the first fully efficient 2-stage oil-cooled rotary compressor early in 1954. Since then, Jaeger "Roto" units have logged thousands of hours on all types of application from street work to heavy rock drilling and pile driving.

Performance has consistently excelled even the best of other rotary compressors. On typical quarry work, for example, operating two 4" wagon drills with air-tugger hoists in hard limestone, 10 hours a day, a Jaeger Roto "600" averaged 7 gallons of fuel an hour in 2200 hours of operation. Its engine never ran faster than 1600 rpm. A Roto "125", handling the air demands of two heavy duty paving breakers, shows an equivalently low fuel consumption of approximately 1½ gallons an hour.

Simple, close, continuous control

Control of engine and compressor is so effective that 100 lbs. minimum pressure is constantly maintained over the entire operating range. Speed modulation is smooth and stepless. Instantaneous control positively prevents overrun and resultant racing of the engine. Furthermore, controls are extremely simple, without metering orifices, complex linkage or toggles. When starting, you merely make one half-turn of a regulator crank to set engine fuel control on "Idle." All controls are conveniently grouped on one side of the compressor.

ROTO 600, holding steady 100 lbs. pressure for 160 working hours (as smooth as steam) kept this Vulcan No. 1 hammer hitting 60 full power blows per minute, with air to spare for breaker and clay spade work.

fully efficient rotary compressor

There are many further advantages. Jaeger's copper tube finned multi-pass oil cooler insures cool operation in over 100° weather. Automatic by-pass valve means no "dry starts" in cold weather. Multiple perforated disc oil filters won't corrode, absorb or freeze. Adjustable radiator shutters maintain engine water temperature on sub-zero days. All sizes have accessible 8-hour fuel tanks. Tool boxes on the "125" hold a full set of tools.

Available in 125 and 600 cfm sizes

To meet the principal demands of users who prefer the rotary type compressor, current production of the Jaeger "Roto" is concentrated in the popular 125 and 600 cfm sizes. *For the many air users who still prefer the piston type, Jaeger reciprocating Air-Plus compressors continue to be available in the "new standard" ratings with the exception of the 600 cfm size.*

For complete information see your Jaeger distributor or send for Catalog JCR-5.

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TRUCK MIXERS • PAVING MACHINES

Mr. Peel and this AMSCO® PUMP have been WORKING TOGETHER SINCE 1926

Haskell Peel, Plant Superintendent at Consolidated Gravel Co., speaks with almost personal affection about this veteran 8" Amsco Pump. He started operating it more than 29 years ago, with a company later bought out by Consolidated. Both Mr. Peel and the pump are still going strong.

He particularly likes to tell about the time a dredge sank, due to a cave-in, and he hooked up his pet 8" Amsco Pump to more than 1,000 feet of 10" pipe—and ran it continuously for three days to pump water out of the lake so the dredge could be refloated.

Nor is Mr. Peel the only booster for Amsco Pumps at Consolidated. Chester Wilson, General Superintendent, says: "For all deposits, Amsco Pumps are the best we've ever used. This is the hardest deposit I've ever been in, yet we handle 19,000 to 22,000 yards of gravel (not counting sand) before shell replacement." J. P. Calhoun, President, adds: "In 20 years of dredging experience, we've found Amsco Pumps do a better job than any we've ever used."

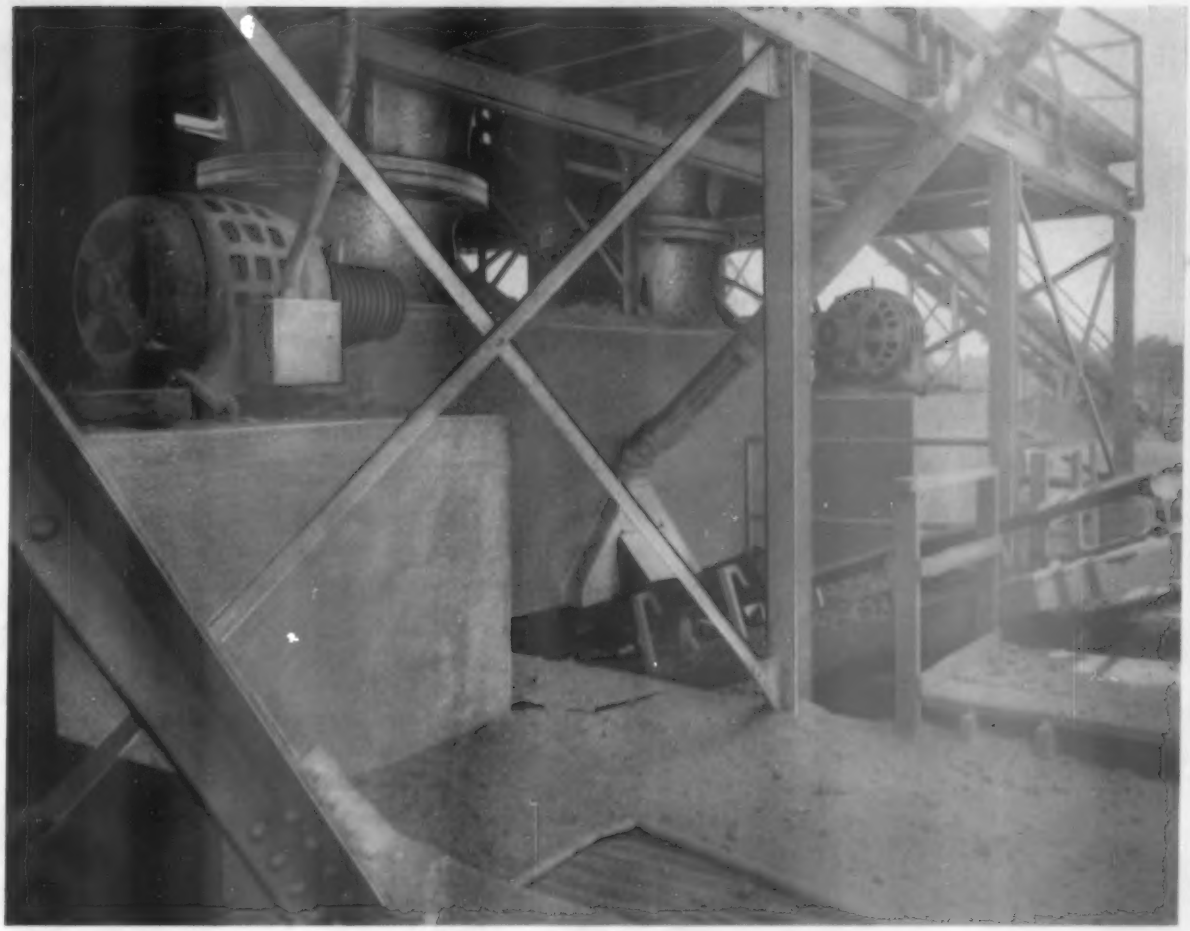
Consolidated uses both this 8" and a 10" Amsco unit for pumping 75% sand, 25% gravel through 300 to 1,000 ft. of pipe with a 50 to 60-ft. lift. Amsco fittings are also used on all pipe lines.

One of the two dredging operations at Consolidated. This dredge houses the 8" Amsco Pump shown above. The other uses a 10" Amsco unit.

Whether your dredging operation is large or small, you can get an Amsco Dredge Pump to handle the job. Standard sizes range from 6" to 20" discharge openings. Larger sizes are also available. An Amsco Pump Engineer will be glad to discuss your requirements, or write for Bulletin 1052P giving full information and specifications on the Amsco line.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.



Production and Profits Go Hand-in-Hand with Traylor TY Reduction Crushers

Owners of Traylor TY Gyratory Crushers know that increased production means increased profits. They know that the exclusive design features and extra-heavy construction of a Traylor TY combine to boost production tonnage, reduce down-time and cut maintenance costs. As a direct result, profits go up hand-in-hand with the increased hourly output of a Traylor TY.

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The compact design of a Traylor TY incorporates maximum strength with utmost simplicity of operation. TY Reduction Crushers are available in six sizes with feed openings from 3" to 22". Send for descriptive bulletin.

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Every Thermoid Belt is pre-stretched to give the most driving power without slippage. C, D and E Section Belts are rayon-grommet type construction. Their brute strength and extra flexibility will take repeated shock loads. They are built to stand up under abrasion, friction, moisture and heat.

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The Thermoid Distributor in your area carries a full line of Thermoid Multi-V Belts, Hose and Conveyor Belting to meet all the needs of construction work. He carries complete stocks and can give you fast service. If you prefer, write direct.

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TWO MODERN, COMPACT, HEAVY-DUTY DIESEL ENGINES

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THE NEW
D339

190 HP	**INTERMITTENT OUTPUT** Maximum recommended for loads of short duration (1 hour or less) with equal periods at idle or low load.	126 HP
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All at 1200 r.p.m. with full equipment

This is the same trouble-free engine which powers Caterpillar's mighty D8 Tractor. Coming soon: the new D342 Electric Set!

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Here are the latest advances in diesel engine design. Compared to other engines in their class, these two new CAT* Engines offer you better operation, less maintenance, higher horsepower and more compact design. Take a quick look!

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For fast starts where a supply of compressed air is readily available, a sturdy vane-type air motor is offered. Also available: air compressors and storage equipment.

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Where speed of starting is especially important. Also available: automatic start-stop controls which require no operating personnel.

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For all-weather starting. This system preconditions the diesel, and supplies full lubrication before diesel is started. Also available: electric starters for the gasoline starting engine.

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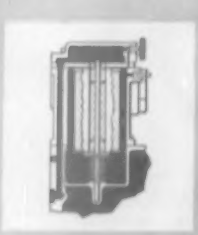
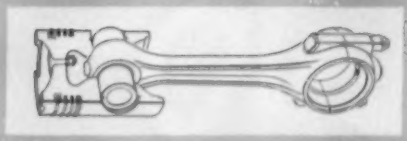
Same famous tinker-free fuel system so successful on other Caterpillar Engines. Capsule-type injection valves with single, large, foul-proof orifices, plus special precombustion chambers, permit these engines to operate—even idle—on low-cost non-premium fuels. And full-flow filtering is assured with new paper-type element that is not affected by water.



FIELD-TESTED PISTON ASSEMBLIES!



Pistons, rings and rods in these two new engines are like those used in Caterpillar's famous V-type Engines. Heat plugs, chrome-faced rings, cast-iron top ring bands give thousands of hours of operation before inspection is necessary.

MANY OTHER IMPORTANT FEATURES!

BRIEF SPECIFICATIONS

D342		D339
Four-cycle, valve-in-head		
6	Number of cylinders	4
5¾ in. x 8 in.	Bore and stroke	5¾ in. x 8 in.
1246 cu. in.	Piston displacement	831 cu. in.
1200	Rated speed, r.p.m.	1200
425	Low idle speed, standard, r.p.m.	425

Your Caterpillar Dealer has full details on both of these compact, new engines. Call him today for modern heavy-duty diesels. And remember him, too, for prompt, complete installation and service.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

We'd be glad to send you more information on the new D342 and D339. Just mail the coupon below.

CATERPILLAR TRACTOR CO., Dept. 8594, Peoria, Illinois, U. S. A.

Send me complete details on the new D342 and D339.

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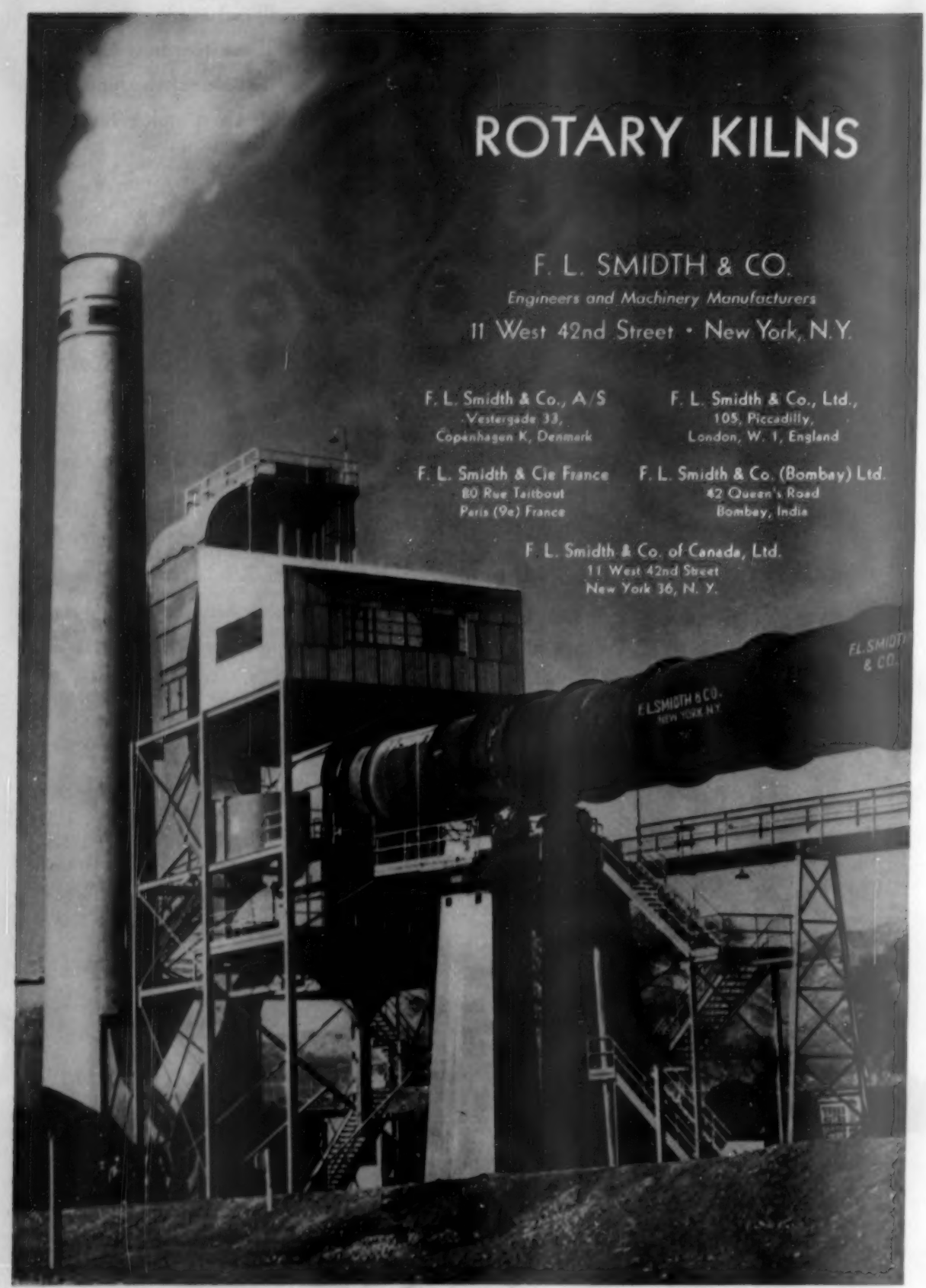
THE D342 AND D339—LATEST EXAMPLES OF CATERPILLAR LEADERSHIP IN ACTION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What's Happening

IN OTHER FIELDS OF INTEREST TO THE ROCK PRODUCTS INDUSTRY

July, 1955

Heavy construction awards, nationally, totaled $7,866,740,000 for the first 22 weeks of 1955, or 42 percent higher than in 1954, and 19.4 percent higher than 1953's previous dollar volume record, as reported in **Engineering News-Record.** Private housing contracts rose to a record-breaking total of $3 billion during the 22-week period, 66 percent above the previous record in 1954. In public works, highway awards totaled $838 million, 23 percent above 1954, a new record for highway contracts. Bridge contracts were $189 million, up 24 percent over last year, but 25 percent below the all-time high in 1953. Public buildings, other than housing, totaled $685 million, off 0.3 percent from 1954.

Use of galvanized sheets for structural reinforcement in concrete construction delays initial tension cracking of the concrete and produces a stiffer slab, according to I. A. Benjamin, research and development engineer, Granco Steel Products Co. Mr. Benjamin spoke at the general meeting of American Iron and Steel Institute in New York, May 25, and he presented data showing that the structural bond between the galvanized sheets and insulating type of concretes enables the concrete to stiffen the corrugated sheet and substantially limit deflections.

Employes of American Aggregates Corp.'s Greenville, Ohio office, toured the firm's Dayton, Ohio, aggregates plant as part of an employe relations program. It was the first time the office employes, some of whom had worked for the company more than 40 years, had seen the sand and gravel plant in operation. The employes also toured the Middletown and Hamilton, Ohio slag plants.

A German-patented additive for pavements, which melts snow as it falls on streets with the treated material, is being studied by Rochester, N. Y., city officials for possible use. An experimental stretch of the treated pavement may be constructed before next winter. The saltless roadways reportedly are in use in Germany and New Brunswick, Canada, and are said not to corrode fenders and bumpers.

An 800-acre quarry site on Kelleys Island in Lake Erie, formerly owned by Kelley Island Co., is being developed by the Cleveland Museum of Natural History, for transfer later to the state of Ohio. The island property, with its glacial groove formations in bedrock, will be preserved as a geological field museum and public recreational area.

A sonic drill, operating through acoustic vibrations, is being developed by Borg-Warner Corp., and is expected to be in use within two years. The drill will be of particular value in drilling hard tough formations, such as found in recovering taconite.

About 30 experimental homes have been built in the Midwest by Tectum Corp., Newark, Ohio, of a construction material known as "Tectum." Developed first in central Europe around 1915, the material consists primarily of wood fibers, a cement compound and chemicals. It is said to be sound-proof, highly insulated, lightweight, and it is rated "incombustible" by the National Board of Fire Underwriters. The material is manufactured in large sheets, to any length or width for a minimum of handling. It is "off white" in color and does not require painting; it has a low rate of expansion under heat and cold; it can be sawed, kerfed, routed, drilled, mortised or nailed; and it resists fungus, dry rot and termites. The material is being used currently in the construction of roof decks for factories, industrial buildings and shopping centers.

Contract awards for construction in the 37 states east of the Rockies, totaled $2,322,085,000, in April, 1955, an increase of 37 percent over April, 1954, according to an F. W. Dodge report. Construction contract awards for the first four months of 1955 were at the highest level for any first four months in history. According to the report, there is no sign that significant surpluses have been produced, although 1955 is the 11th consecutive year of mounting construction volume. Individual four-month 1955 totals compared with the like period of 1954 were: non-residential, up 23 percent at $2,564,-140,000; residential, up 43 percent at $3,494,316,000; and heavy engineering, up 38 percent at $1,484,041,000. These three major categories set new April records, as well as first-four month records.

An abandoned quarry south of Okoloma, Ky., is being converted into a rustic outdoor chapel by the Okoloma Baptist Church. The outdoor chapel, about 25 ft. deep, will be in the rear of a new church building, costing about $200,000. The structure will have a full basement, and will seat about 800 persons. The church purchased the site from Carl Fisher and Mr. and Mrs. Joseph Wacker for about $12,000. The outdoor chapel will be the first of its kind in Jefferson County, Ky.

A bill prohibiting the use of natural rock asphalt on Indiana highways was passed recently by the state house of representatives. Rep. Richard Fisher-ing reported that use of the material had cost the state $4,286,000 in 1954, and that it had entailed further undetermined loss in quickly deteriorating road surfaces where material was used.

A concrete-curing process, expected to hasten the building of bridges and viaducts, is being used by the New Jersey Highway Department. The curing technique features 3-ft. square mats laid on top of the concrete with vacuum hoses drawing off excess water. With this process, wooden forms supporting wet concrete on the bridge roadways can be removed in 2½ days.

Low speed landing along with thrust reversers may eliminate the need for special landing fields with long runways, according to John S. Attinello, head of the supersonics section of the Navy's Bureau of Aeronautics.

Norway's consumption of cement per capita rose 58 percent in the past five years, the 1954 consumption averaging over 600 lb. per person.

THE EDITORS

stop using TWO machines

to do a ONE machine job

HYSTAWAY® combines crane and tractor in ONE machine

Mount a Hystaway on a new **or used** Caterpillar-diesel Tractor and you get a hard-working piece of equipment that allows one operator and one machine to do a job that formerly required two separate machines (crane and tractor.)

With Hystaway one man and one Machine handle all secondary breaking and clean-up. Hystaway, equipped with crane boom and drop ball, mounts easily without alteration on a new or used Caterpillar D6, D7, or D8 Tractor.

Handy for maintenance work—able to travel at tractor speeds, Hystaway also keeps busy on jobs such as lifting screens and motors on crusher repairs, building and maintaining haul roads.

If you are now using two separate machines (crane and tractor) to handle secondary breaking and clean-up, it will pay you to investigate the savings in operating costs made possible by the Hystaway-Tractor combination.

See your Caterpillar-Hyster dealer for details, or write direct to Hyster Company, 2918 N. E. Clackamas Street, Portland, Oregon or 1818 N. Adams Street, Peoria 1, Illinois.

HYSTER COMPANY

"Matched Design" Tractor Tools for Caterpillar-built Tractors

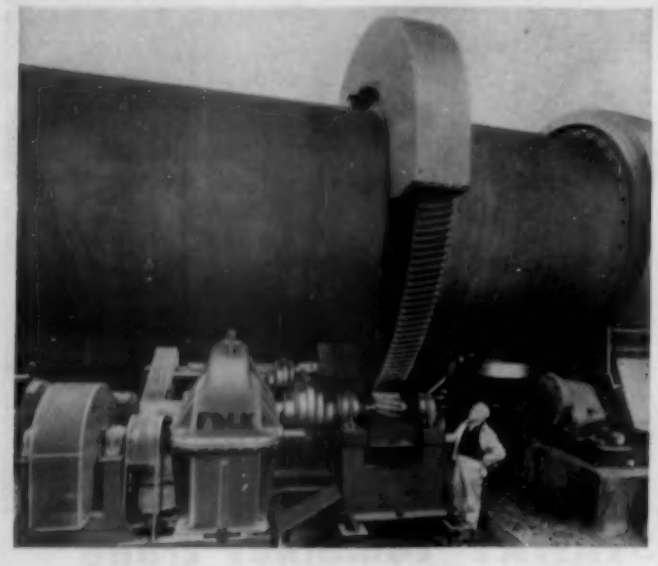
HYSTER

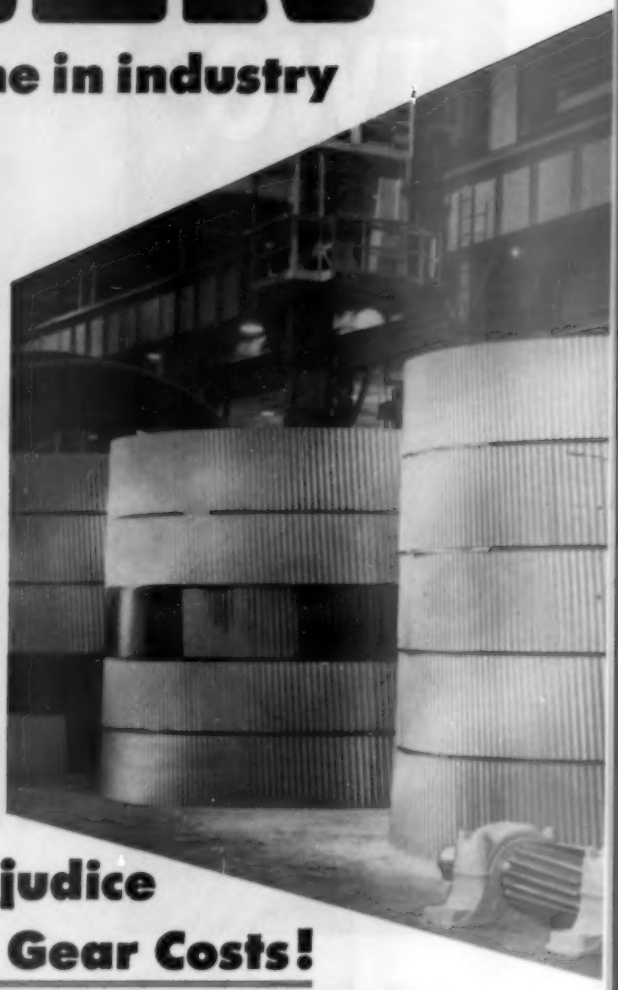
Gears by FALK

...a good name in industry

RIGHT: Single helical ring gears being prepared for shipment.

BELOW: Falk tandem-drive speed reducers, couplings and single helical split ring gears, shown driving a cement kiln 11' 3" in diameter x 450' long.





Falk's Freedom from Prejudice Can Cut Your Gear Costs!

It is false economy to use spur gears on applications which need modern helical gears. Further, it is a mistake to use a *double* (herringbone) helical where a *single* helical will serve more satisfactorily—or vice versa!

You'll find it *good business* to consult Falk—long-recognized leader in precision gear development—on your gear needs. For Falk is best equipped to recommend and produce the proper gear for any requirement—single or double helical, or spur—without prejudice! This freedom from bias is your assurance of getting the exact gear you need—and getting the maximum return from your gear investment.

Operators and engineers know that precision-cut Falk Helical Gears (with two or more helical-cut teeth sharing the load at every instant) last longer, are less subject to destructive damage from ever-present abrasives than gears of any other type. Helicals wear *in*, instead of wearing *out!* Because of their higher possible ratios, helical gears permit use of higher-speed motors.

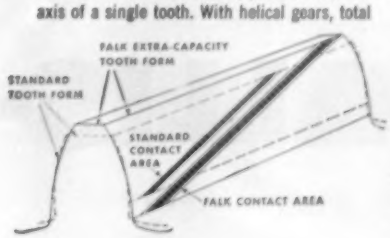
All this adds up to substantial savings: Your long-range gear costs are less because helicals last longer ...you save on maintenance, prime-mover costs, power bills and floor space. Because power transmission is smoother, driving and driven machinery performs better, has longer life.

Consult your nearest Falk representative for full information—or, if you prefer, write to us concerning your gear problems, plans and requirements.

THE FALK CORPORATION ... 3001 W. CANAL ST., MILWAUKEE 8, WISCONSIN

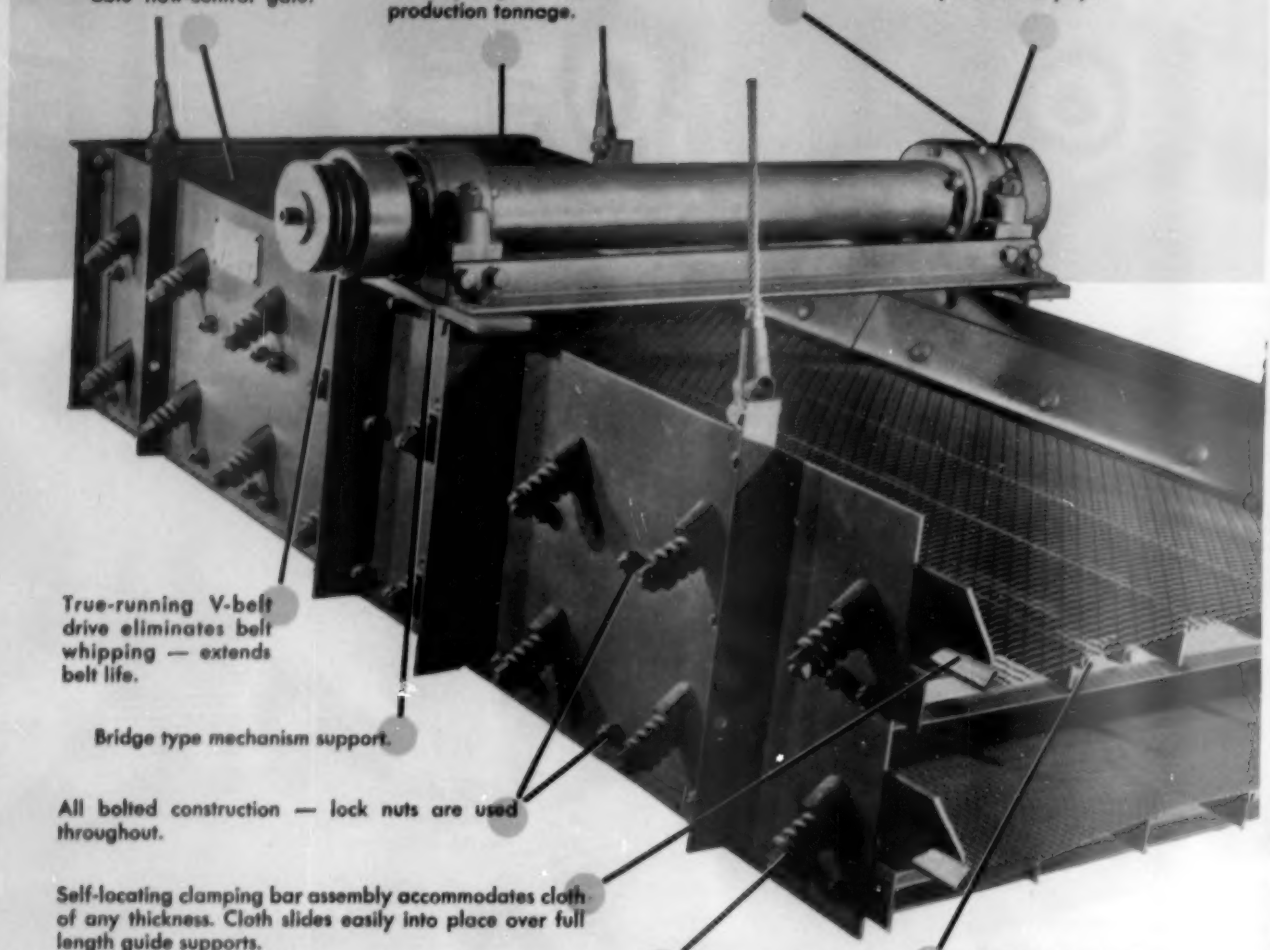
GEAR FACTS FOR ENGINEERS

One factor determining gear rating is the amount of contact area (length and width) on teeth when engaged. With spur gears, the contact area is a narrow band, parallel with the axis of a single tooth. With helical gears, total contact area is the sum of the oblique contacts over the face of two or more teeth. Thus helical gears have substantially greater capacity than spur gears.



The Falk Helical Gears offer a special extra-capacity tooth form. The extra capacity is obtained by cutting deeper teeth that are broader at the base than ordinary helical tooth forms. This results in the larger contact area and stronger tooth shown in the sketch. Years of laboratory tests and thousands of actual field installations have proved conclusively that the exclusive tooth form of Falk single helical and herringbone gears provides substantially superior load-carrying capacity.

A NEW High



Feed box (optional) protects screen surface by absorbing impact of incoming material. These screens can also be equipped with an adjustable flow-control gate.

Back plate is standard. It adds rigidity — converts spillage to extra production tonnage.

Advanced method of lubrication—surer, safer.

Simplified vibrating mechanism can be replaced in a jiffy.

True-running V-belt drive eliminates belt whipping — extends belt life.

Bridge type mechanism support.

All bolted construction — lock nuts are used throughout.

Self-locating clamping bar assembly accommodates cloth of any thickness. Cloth slides easily into place over full length guide supports.

Springs prevent whipping and breakage of screen cloth.

Full length rubber buffer strips are replaceable. Cushioning of cloth means longer screen cloth life.

New Bulletin

In addition to telling the complete story of this new high quality *Aero-Vibe* screen, bulletin 07B6099A provides handy information on how to select type and size of vibrating screen. Get your copy from your nearby Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

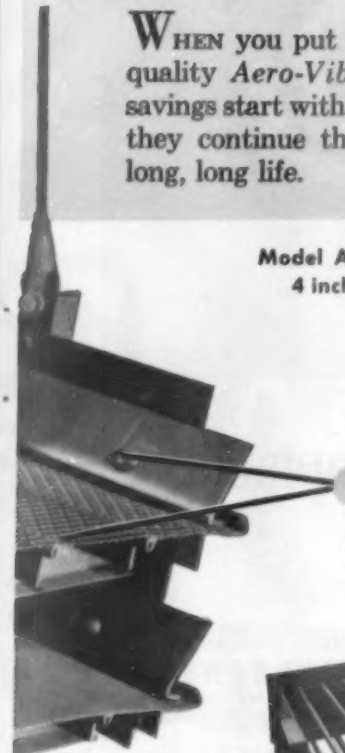
Aero-Vibe is an Allis-Chalmers trademark.

ALLIS-

Quality SCREEN AT A NEW Low Cost

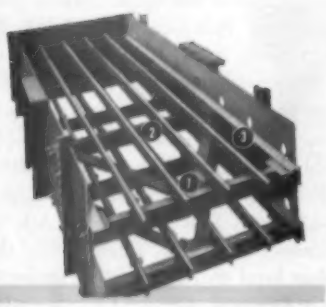
WHEN you put one of these new high quality *Aero-Vibe* screens on the job, savings start with a low initial cost—and they continue throughout the screen's long, long life.

Now, aggregate producers, small and large, can profit from the top screening efficiency and steady, low cost production made possible by the newest and best in vibrating screen design. A-4775



Model AVS handles feed up to 4 inches (coal up to 6 inches).

Proper spacing of clamping bar bolts and correct camber provide added life to screen cloth.



STURDY FRAME

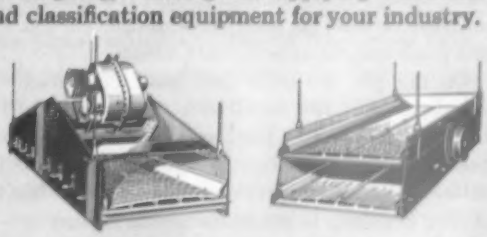
1 Rigid, X-frame construction

2 Heavy channels

3 Replaceable steel cross members

ENGINEERING HELP

Whether you are establishing a new operation or revising an old set-up, you can get as much help as you want or need from Allis-Chalmers . . . a company with over 75 years of experience in designing, building and applying reduction and classification equipment for your industry.



No matter what the screening problem, there is an Allis-Chalmers vibrating screen designed to meet your specific needs.

CHALMERS AC ALLIS-CHALMERS

Double the Life of Earth-Moving Equipment *by* **Hard-Facing**

Trencher teeth stay sharper 2 to 3 times longer when hard-faced with HAYSTELLITE tungsten carbide rod. The hard-facing material protects the teeth from severe abrasion as they tear through rock, sand, shale, and clay at high speeds. HAYSTELLITE tungsten carbide has good shock resistance, too, and won't chip off under sudden impact.

On this job, the teeth were made of a tough vanadium steel and faced with a thin layer of HAYSTELLITE tube rod. The combination of a tough base metal and an extremely hard, wear-resistant surface helped to double the continuous service life of the trencher. Other earth-moving equipment subjected to abrasion and impact can be protected in the same way. Bull-dozer blades, dipper teeth, post-hole diggers, road disks and plows, will all operate for long periods of time, at low maintenance cost, when hard-faced with HAYSTELLITE tube rod.

Your local dealer carries a complete line of HAYNES hard-facing alloys. He will be glad to recommend a HAYNES rod especially designed to resist abrasion, corrosion, impact, erosion or heat. Ask him for descriptive literature. If you don't know the location of your local dealer, write to Haynes Stellite Company, a Division of Union Carbide and Carbon Corporation, Kokomo, Indiana, for full details.

See... | Your local Haynes Stellite Dealer

— or —

Write... | to Haynes Stellite Company

"Haynes" and "Haystellite" are registered trade-marks of Union Carbide and Carbon Corporation.

for HARD ROCK

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TELSMITH
Equipment in this Plant

42" x 12' Heavy-Duty Apron Feeder

30" x 42" Jaw Crusher

4' x 10' Heavy-Duty Scalper Screen

48-S Gyrasphere Crusher

30" x 5'6" Heavy-Duty Plate Feeder

Two 5' x 12' Double Deck Vibro-King Finishing Screens

Two 36-FC Gyrasphere Crushers

Five Telsmith-BG Conveyors—24" to 30" wide, 35' to 204' long

Four Bin Gates, 15" x 15", 16" x 18", Simplex, Siquad, Boquad

Q-27

Fitzgerald Bros. Construction Co., Inc. of Troy, New York, producers of asphalt and ready-mix concrete, decided to build their own aggregate plant to crush an extremely hard and abrasive trap rock into New York State specification sizes. They selected a complete Telsmith plant.

This plant was designed, engineered and equipped by Telsmith in co-operation with Edmund Fitzgerald who is in charge of all operations and who originated many of its special features.

Only four men, including the truck loader, are required to operate the plant. With its remarkable flexibility it can produce all desired sizes with maximum economy. Let Telsmith engineers help you in plant planning and equipment selection. Send for Bulletin 266.

SMITH ENGINEERING WORKS

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GOOD NEWS travels fast . . . word's getting around that a *modest investment* in Eagle Aggregate Washing-Classifying-Dehydrating Equipment can lick the dirty, unacceptable material problem and enable a producer to provide blends of sand to meet strict specifications. A number of sand and gravel firms in the Northwest have been producing high quality materials, much in demand, since installing Eagle units. Chalk up two more on the growing list.

EAGLE WASHERS-CLASSIFIERS SOLVE PROBLEM FOR TWO MORE NORTHWEST AGGREGATE PRODUCERS!

Associated Sand & Gravel Co., Everett, Wash., is thoroughly washing and classifying material with a 24' single Eagle Water-Scalping-Classifying Tank equipped with 2-cell collecting-blending flume, which discharges into a 24" dia. x 18' fine material, double screw unit.

Pacific Sand & Gravel Co., Centralia, Wash., uses Eagle equipment profitably at several plants. Plant shown is temporary set up to take care of a contract. Eagle units consist of 16' Water Scalping-Classifying Tank and 24" dia. x 22' single screw, fine material washer-classifier-dehydrator. The clean material produced readily meets contract specifications.

It's "good riddance" to Aggregate Washing-Classifying Worries When You Call In Your Factory-Trained **EAGLE EQUIPMENT DISTRIBUTOR:**

He will show you how to get your washing-classifying job done with minimum investment. He will see that you get satisfaction and service—backed by the entire Eagle organization. He will give you the benefit of our vast experience and field study. Let us put you in touch with him. Send for copy of Catalog 55.

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EAGLE IRON WORKS
EXPERIENCE-PROGRESS-SERVICE SINCE 1872

EDITOR'S PAGE

Properly Designed Concrete Houses Resist Atomic Blast

RESULTS FROM THE CIVIL DEFENSE NUCLEAR TESTS on May 5 at Yucca Flats, Nevada, indicated that concrete homes of the type now being built to withstand earthquakes and hurricanes may also serve effectively as bomb shelters. We now know that to be true for houses of such design if they are as close as forty-seven hundred feet from an atomic blast with a shock equivalent to thirty-five thousand tons of TNT.

Two of the houses under test were of lightweight concrete masonry units of the expanded clay or shale type of aggregate and two others were precast concrete houses made from the same aggregates. One of each type was constructed just forty-seven hundred feet from the blast and two were ten thousand five hundred feet away.

An explosion that sheered off telephone poles like matchsticks, twisted vehicles into unrecognizable shape and which wrecked or seriously damaged houses and industrial structures of other materials at the forty-seven hundred foot mark did but minor structural damage to the concrete houses. Those at the more distant location had almost no damage. Windows and doors were blown out in all the houses, and hairline cracks developed in the mortar between the masonry units and in the side of the precast house exposed to the blast at the closer location. The roofs were intact and there was no displacement.

Important Sales Point

The tests did reveal that the greatest danger to occupants of such houses would be flying glass and furniture but they also proved, should residents survive the initial blast, that such structures would provide protection from dangerous fall-out of radioactive material.

Resistance of these houses to the force of an enormous atomic blast points the way to better products and design for commercial, residential, school and other buildings. It suggests that the type of design used for these houses could be applied to protect individuals against possible atomic attack and at the same time give security against the destruction this country suffers each year from hurricanes and tornadoes.

Force of the explosion at Yucca Flats resulted in an overpressure of 5 p.s.i. at 4700 ft. which is a wall pressure of 720 lb. per square foot or the equivalent of a wind velocity exceeding four hundred miles per hour. Duration of the shock was but three-quarters of one second.

The houses were designed for a wind load of thirty pounds per square foot so it is apparent they did not withstand the entire overpressure. It would appear from comparative performance under earthquake stresses, which are of longer duration, that the stress applied from atomic blast is related to both time and mass. Further speculation would have it that the elasticity of the lightweight concrete in combination with its mass probability did not permit it to be subjected to the overpressure during such a short time interval.

Both types of concrete houses had four rooms on one floor and were of conventional design, according to accepted Pacific Coast Building Code requirements to resist earthquakes, and complied with F.H.A. structural standards. Those of masonry construction were of standard eight-inch units made to A.S.T.M. specifications and the precast houses were identical in design to those sold for several years on the West Coast. Each had a flat overhanging roof of six-inch reinforced lightweight concrete slab construction.

Design Features

Exterior walls of the masonry houses were reinforced with ½-in. vertical steel spaced on 32-in. centers in addition to horizontal reinforcing. Partitions of similar design could withstand lateral pressure should windows be shattered. Such reinforcing adds little to the cost of a house. Walls and partitions of the precast houses were of six-inch thick concrete panels.

The most important design feature was that the roofs were tied to the side walls to provide a positive and absolute diaphragm action under stress so that all segments functioned as a unit. Observations at the Tehachapi earthquake in California a few years ago showed that structures not so reinforced did not fare well and totally unreinforced houses were badly damaged.

Use of flat roofs permitted obtaining this diaphragm action but there is no reason why a modest pitch could not be designed to provide similar action and possibly with some weight saving if prestressing be used. Should there be objection to flat or low pitched roofs in some locales, that could be overcome by building a non-structural, load-bearing pitched roof over a flat roof with the flat roof functioning with the walls to resist shock.

Final evaluation of results from the blast will likely indicate that basements in houses will contribute to greatest safety, which is to the advantage of the concrete industries.

Concrete masonry and precast construction were so outstanding in the test that everyone in the industry should follow through and get this story across by every means.

Bror Nordberg

It's new! Gardner-Denver "Air Trac"® Drill
a self-propelled drilling rig with heavy-duty drill

The Economical Answer to Deep Hole Percussion Drilling in Pits, Quarries and Surface Rock Cuts

Spots accurate holes . . . drills fast . . . on steep hillsides or rough or rocky ground.

Air Trac crawlers have full-traction shoes — each track self-propelled through double-chain drive by its own Gardner-Denver high-torque, five-cylinder radial air motor.

Self-equalizing, self-stabilizing column arm supports Gardner-Denver chain feed drilling mast. Rugged chain feed powered by a high-torque, five-cylinder radial air motor.

Two Air Trac models — one equipped with powerful DH123 (4½") drill — one with the smaller DH99 (4") drill. Furnished with high-quality Gardner-Denver Ring Seal Shanks and Gardner-Denver Sectional Drill Rod equipment for efficient, low-cost deep hole drilling. Send for full specifications.

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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

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"Chemistry of Soil"—Perhaps of Concrete!

ROCKY'S NOTES

NATHAN C. ROCKWOOD

WHEN WE FIRST EXAMINED a new textbook on soils it was anticipated that its only interest to our readers would be to those who produce and supply soil improvers and conditioners—lime, limestone, phosphates and other "rock fertilizers." However, in reviewing similar texts we have suggested in these columns on previous occasions, that it seems impossible to study this subject without being impressed by the fact that soil chemistry is closely associated with the chemistry of cement and concrete. The text we have before us is "Chemistry of the Soil,"* edited by Prof. Firman E. Bear, Rutgers, The State University of New Jersey. His name and reputation are well known to all lime and limestone producers for he has been a lifelong advocate of the practice of soil liming, and the industry (as well as agriculture) owes him an enormous debt.

This book of 373 pp. is a collection of ten papers or chapters by specialists in each field. The chapters and their authors are as follows: (1) "Soil Development," by Isaac Barshad; (2) "Chemical Composition of Soils," by Kirk Lawton; (3) "Colloid Chemistry of Soils," by Stephen J. Toth; (4) "Cation and Anion Exchange Phenomena," by Lambert Wiklander; (5) "Soil Organic Matter," by George F. Fraser; (6) "Soil Fixation of Plant Nutrients," by Louis T. Kardos; (7) "Oxidation - Reduction Processes in Soils," by F. G. Merkle; (8) "Acid, Alkaline, Alkali, and Saline Soils," by D. Wynne Thorne and Lloyd F. Seatz; (9) "Trace Elements," by Robert L. Mitchell; (10) "Soil Chemistry and Plant Nutrition," by Adolf Mehlich and Mack Drake; with an appendix "Methods in Soil Analysis" by Arthur L. Prince.

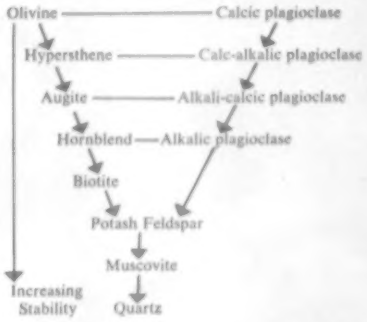
Soil Stability

Soils are composed primarily of clay—that is to say of aluminosilicates. It could also be said with considerable accuracy that concrete is composed of aluminosilicates in a consolidated or cemented form and composed of much larger soil fragments. All soil is broken-down or disintegrated rocks, which are mainly aluminosilicates—the ultimate fate of all such rocks, including of course that artificial kind we call portland-cement concrete. Hence, their chemical and physical structures as well as extraneous conditions that are conducive to disintegration of aluminosilicate rocks are, or at least should be, of very great interest to those of us who study the causes of the breakdown and disintegration of concrete. Without questioning that most concrete is sufficiently durable for its purposes, it is not stable or durable in a geological sense.

That a beginning has been made in this direction, although apparently with no reference to work done in soil chemistry, is evidenced in a recent paper by T. C. Powers and H. H. Steinour, of the Portland Cement Association, published in two parts in the February and April 1955 issues of the *Journal of the American Concrete Institute*, under the title "An Interpretation of Some Published Researches on the Alkali-Aggregate Reaction." These authors have applied the theory of base exchange (or ion exchange) phenomena to the intricate problem of fairly rapid concrete disintegration caused by certain chemical and physical structures and conditions within the concrete. The same problem in a different form has been studied and explained, in theory, in various treatises on soil chemistry for several years. We will not go into that in any more detail here because in a later issue it is intended to explore the subject with particular reference to this P.C.A. work and to other recent research on cement and concrete.

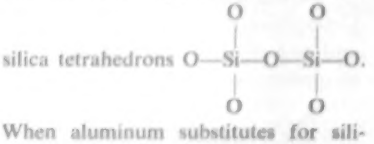
The chapter on "Soil Development" contains a wealth of suggestive material, in readable language, on why some kinds of silicate rocks disintegrate much more readily than others. Of course, everyone who has ever read anything in geochemistry knows that hardened portland cement violates a prime requisite of stability in a geological sense because it is far too basic in composition. For example, to quote from our text: "The relative stability of minerals to weathering and to decomposition with acids also appears to be related to the degree of basicity, degree of linkage of the tetrahedrons, relative number of alumina and silica tetrahedrons, and other factors that induce a lowering of the basicity, of the mineral and destruction of the bonds linking the tetrahedrons * * * * the less basic the mineral, the more stable it is." That is, the tighter the tetrahedrons are linked and packed together, the greater the stability.

A diagram of the increasing stability of minerals (p. 23) is given thus:



Translated briefly into words this means that quartz is the most stable or durable, and olivine on the left and calcic plagioclase on the right the least stable or durable—something to remember in selecting concrete aggregates. Our author says the *decreasing* stability going up the left-hand branch (to olivine) is due to a decrease in the degree of linkage in the tetrahedrons, whereas the decrease in stability going up the right-hand branch (to calcic plagioclase) is due to an increase in the number of alumina tetrahedrons. That, in view of the previous description of the structure of the silicates, is to emphasize that the strongest bonds are those between the silicon and the four oxygens in the bonded

silica tetrahedrons

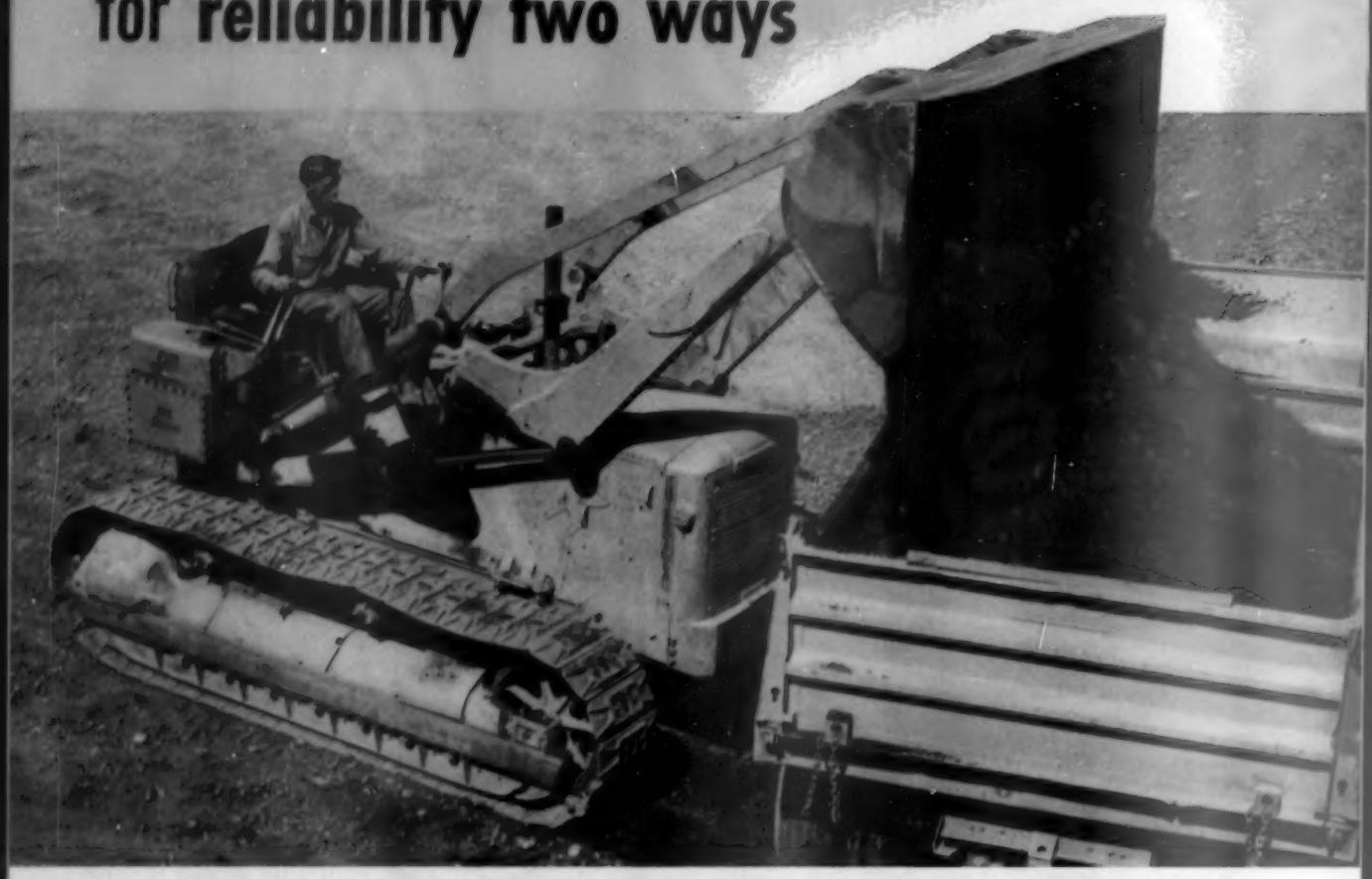


When aluminum substitutes for silicon, because its valence is only 3 instead of 4 as for silicon, another cation (positively charged ion) has to be introduced to neutralize the electrostatic charges of the system, and these generally form bonds much weaker and more readily dissolved or broken than those of the silica tetrahedron linkages. Various other factors affecting durability are described, all of which are just as applicable to concrete as to the natural silicate minerals. So far as we know, cement, concrete

(Continued on page 90)

*Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y., price $8.75.

Alaskan chooses CAT* No. 6 Traxcavator for reliability two ways



In Alaska you need equipment you can count on. Frank B. Kempton of Anchorage, a gravel pit operator, bought this Caterpillar No. 6 Traxcavator* for two big reasons:

1. *Reliable operation.* Its traditionally rugged Caterpillar construction keeps this machine on the job and out of the shop. With a short work season, Mr. Kempton can't afford down time.

2. *Dependable dealer service.* In Alaska, an equipment owner is entirely dependent on his Caterpillar Dealer. He must have a source he can trust for service know-how and a full stock of genuine factory parts.

Is Frank Kempton happy with his choice? Listen: "I've had low maintenance and very steady operation with Caterpillar equipment. I get parts when I need them, and can depend on my Caterpillar Dealer."

The No. 6 Traxcavator is shown here loading out gravel in a bank run pit at Fort Richardson. In an hour the machine loads 24 trucks, averaging 7 to 10 yards per load. That's fast production—due in large part to the carefully engineered balance of the machine. Weight, horsepower and bucket capacity are matched so that tracks stay on the ground. Controls are well-placed and fast-acting. Visibility is unexcelled.

Like all Caterpillar Engines, the diesel in the Cat No. 6 Traxcavator will deliver full power, and idle without fouling, on money-saving No. 2 furnace oil. It all adds up to this: you can depend on Caterpillar-built equipment to do *more work at less cost with lower down time* than any other make. Ask your Caterpillar Dealer to prove this statement—on your job.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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LABOR RELATIONS TRENDS

By NATHAN C. ROCKWOOD

End of Long Fight Against Walsh-Healey Act

READERS OF THIS PAGE may recall the article in the October 1951 issue about the case of the Ready-Mixed Concrete Co., Ltd., Honolulu, H. I. The case has so many interesting details that we are reprinting the beginning as published in the October issue referred to. The original decision was made on May 11, 1951, by the U. S. Department of Labor, Public Contracts Division, which has supervision of enforcement of the Walsh-Healey Public Contracts Act. A number of questions arose as to just what employes came under the Act and would have been entitled to overtime pay, except for the statute of limitation in the Portal-to-Portal Act. The employes under investigation included not only those at the batching plants, but those engaged in producing crushed stone and sand aggregates.

The quarry foreman was held to be covered by the Act, even though classified by the employer as a superintendent, because he spent as much as two hours a day working drills himself, and on some occasions also set powder charges. Foremen employed at the concrete plants who did no manual work, other than occasionally to give a hand to employes under their supervision, were held exempt from the Act. The foreman in complete charge of the night shift at the concrete plant, whose duties included hiring and firing and recommending employes for promotions, was exempt from the Act. The batch plant operators (scale men) were held to be subject to the Act. It was held that "although the occasional performance of manual duties as an incident to purely supervisory duties does not bring foremen within the coverage of the Act, the manual tasks performed by the batch plant operators were more than such incidental duties."

It should be stated here that the alleged violations of the Act occurred during the war, between June, 1941, and January, 1945. Action by the Federal Government did not begin until April, 1948. The statute of limitations established in the Portal-to-Portal Act of 1947, the Labor Department held, did not apply to a Government action to recover liquidated damages under the Walsh-Healey Act. It did prevent the employes from attempting suits for recovery of any unpaid wages alleged to be due. The Government's estimate of liquidated damages was $22,060.57. Much of the work involved was for the military and on verbal orders. The Labor Department examiner held that this made no difference, even if compliance with the Walsh-Healey Act was not specifically mentioned. The act applies, the examiner said, to all government contracts for indeterminate amounts, notwithstanding the statutory limitation of $10,000, since the coverage has been construed as extending to all contracts the sum of which may exceed $10,000. The employer's contention that some of the orders were filled from stockpile, accumulated while not filling government orders, did not hold because the stockpiles were never sufficient to fill the orders without replenishment after the receipt of the government orders.

The only employes exempted from the Act were the repair and maintenance men, who were specifically named exempt under Rulings and Interpretations No. 2 issued by the Secretary of Labor in 1939.

In numerous instances former hourly-rate employes were subsequently put on monthly salaries, and were paid substantial bonuses in addition. This, however, did not alter their status, according to the examiner's ruling, and in several instances these employes were alleged to have worked as much as 60 hours a week without the overtime payments required by the Act. The government did not depend wholly on the testimony of the employes involved. Some of them did not wish to appear against their employer. But their cases were included based on time records, so far as obtainable, of those who worked with them.

Obviously, there are many points of extreme interest to all producers of aggregates and ready-mixed concrete who do business with the Federal Government. On the face of the decision it would appear that this producer was being penalized five years after fulfilling his contracts in a military emergency, during which both he and his employes worked overtime from patriotic motives.

Continued Government Business

The company continued to fill government orders after January 1, 1945, but the Government tried to collect for previous alleged violations by withholding payments for some of these later orders. There was nothing else for the producer to do but sue the Federal Government in the U. S. Court of Claims, where the case was decided on April 5, 1955, and it would seem that our Honolulu friend has won to the extent of recouping some of the money the Government has illegally held out.

What follows are quotations from the decision of Judge Madden, for the five judges of the U. S. Court of Claims: "The plaintiff's petition asserts that it had a contract with the Government, made on or about June 23, 1944, to prepare and furnish to a Navy installation in Hawaii some 65,000 tons of crushed stone and gravel; that in January 1945 the contract was amended to include 69,000 more tons of the same material; that the Government accepted and paid for some 44,000 tons, but, on or about March 15, 1945, notified the plaintiff that it would not order or accept or pay for any more crushed stone and gravel; that thereafter the Government did accept and pay for some 12,000 more tons, but refused to accept and pay for the remaining 76,000 tons covered by the contract. It is not necessary, for present purposes, to recite further the allegations of the petition. The plaintiff asks for damages in the amount of $76,748.70.

Government Counterclaim

"The Government has filed a counterclaim in which it asserts that between June 11, 1941 and January 1, 1945, it had 17 contracts with the plaintiff, nine for the furnishing of stone products to the Army and eight to the Navy; that each contract contained an agreement to comply with the Walsh-Healey Public Contracts Act, 49, Stat. 2036, 41 U.S.C. 35—45; that the Acting Secretary of Labor issued a complaint charging the plaintiff with violating the Walsh-Healey Act in failing to pay the overtime wages required by that Act; that in proceedings pursuant to that complaint it was determined, on September 9, 1953, by the Administrator for the Wage and Hour and Public Contracts Division, United States Department of Labor, that the plaintiff was indebted to the United States by rea-

(Continued on page 92)

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PEOPLE

IN THE NEWS

L. J. Boucher Retires

L. J. BOUCHER has retired as plant manager of the Northampton, Penn., plant of Universal Atlas Cement Co., New York, N. Y., and will be succeed-

L. J. Boucher

ed by Raymond W. Smith, who has been assistant manager at the plant since 1947. Richard E. Miller, formerly general operating foreman at Hudson, N. Y., replaces Mr. Smith as assistant plant manager at Northampton.

Mr. Boucher, a native of Marshalltown, Iowa, is a graduate of the Missouri School of Mines and Metallurgy, Rolla, Mo., with a B.S. degree in mining engineering. He joined Universal Atlas in 1915, working in the quarry at the Hannibal, Mo., plant until 1927

Raymond W. Smith

when he was appointed assistant plant manager at Northampton. In 1947, he was appointed plant manager.

Mr. Smith is a native of Schoenersville, Penn., and attended Lehigh University, Bethlehem, Penn., where he studied electrical engineering. He joined Universal Atlas in 1921 as clerk at the Northampton plant. In 1925, he was promoted to engineer and one year later to foreman. He was made assistant general operating foreman in 1945 and assistant plant manager in 1947.

Mr. Miller was born in Northampton, Penn., and graduated from Lehigh University with a B.S. degree in chemistry. He joined Universal Atlas

Richard E. Miller

in 1946 as a technical assistant in the New York tests and research department, and later transferred to the Hudson plant in the same capacity. He was promoted to chief technician in 1947 and one year later to assistant chief chemist and inspector. He was made general operating foreman in 1951.

Heads Gravel Firm

J. K. JENSEN, who has been president of the Janesville Sand and Gravel Co., Janesville, Wis., since it was organized in 1910, has been named chairman of the board and his son, Ellis E. Jensen, has been named to succeed him as president. J. K. Jensen founded the Janesville Cement Shingle Co. in 1907, and as the company expanded it was organized in 1910 as the Janesville Sand and Gravel Co. Ellis E. Jensen joined the company in 1945, after having been associated with Allis-Chalmers Manufacturing Co. He has been serving as treasurer. G. F. Ehrlinger, secretary, who joined the company in 1910, has ben appointed secretary-treasurer, and J. R. Jensen, vice-president, has been made assistant secretary-treasurer.

U. S. Gypsum Works Manager

JOHN R. BURNS has been appointed works manager of the Shoals, Ind., gypsum mine and plant of United States Gypsum Co., Chicago, Ill. He was formerly works manager at the Hagersville, Ont., Canada, plant. A graduate of St. Victor's College and the University of Illinois, Urbana, Ill., with a B.S. degree in mining engineering, Mr. Burns joined the Sweetwater, Texas plant as a student engineer. Following four years' military service in World War II, he returned to the Sweetwater plant where he served successively as quarry engineer, quarry shift foreman and quarry mantenance supervisor. In 1947, he was transferred to the plant at Plaster City, Calif., as quarry engineer and subsequently became quarry and railroad superintendent and mill superintendent. In 1952 he was named works manager of the Hillsborough plant in New Brunswick, Canada, and a year later was appointed works manager at the Hagersville plant in Canada.

Raymond Concrete Promotions

MYRON W. KRUEGER has been named executive vice-president of the Raymond Concrete Pile Co., New York, N. Y., and Donald W. Moss has been named vice-president in charge of domestic sales. Mr. Krueger joined the firm in 1948 as treasurer and was named a director in 1951 and a vice-president a year later. He will continue as director and treasurer. Mr. Moss became associated with the company in 1936 and has been an assistant vice-president since 1953.

Administrative Assistant

C. E. AMOS, assistant general manager, ore mines and quarries, Jones & Laughlin Steel Corp., Pittsburgh, Penn., has been named administrative assistant to the vice-president of production.

Warner Promotions

FRANK R. CADMAN, assistant to the president, Warner Co., Philadelphia, Penn., was recently elected vice-president in charge of industrial relations, in addition to his duties as supervisor of employe communications, safety and personnel problems. A graduate of Wesleyan University, Middletown, Conn., Mr. Cadman joined Warner Co. in 1941 as assistant industrial relations manager. Two years later he was appointed industrial relations manager and in 1952 was named assistant to the president.

Lea P. Warner, Jr., safety engineer, has been appointed director of safety in charge of the safety program, Workmen's Compensation and employe services. Mr. Warner studied mechanical engineering at Cornell University, Ithaca, N. Y., and during summer vacations worked in the engineering department of Warner Co. and at the plants. He became a regular employe in 1931. Three years later he was appointed personnel manager. Mr. Warner has been active in the National Safety Council and recently served as chairman of the Cement and Quarry Section.

Calvin Purnell, formerly personnel manager of the Bellefonte division, has been transferred to Philadelphia as manager of employe relations. A graduate of Pennsylvania State College, Mr. Purnell joined the Bellefonte plant in 1938 and subsequently became assistant to the general superintendent. After three years' service in the Navy, he returned to Warner Co. and was made personnel manager of the Bellefonte division.

John Hassinger has been appointed personnel manager of the Bellefonte division, succeeding Mr. Purnell. He was formerly manager of the Bellefonte office of the Central Pennsylvania State Employment Service.

Joseph O. Sherod has been appointed general manager of the lime division. He was formerly chief industrial engineer. Born in Keosauqua, Iowa, Mr. Sherod graduated from the University of Iowa, Ames, Iowa, as a chemical engineer. He joined Warner Co. in 1952 as manager of the magnesia plant at Cedar Hollow. When the plant was closed down, Mr. Sherod was appointed assistant to H. J. Whitten, vice-president, and in 1954 became chief industrial engineer.

Re-elected N.L.A. President

AMOS BRADLEY MINER, general sales manager of the industrial division of National Gypsum Co., Buffalo, N. Y., was re-elected president and chairman of the board of the National Lime Association at its recent

Amos Bradley Miner

meeting in Hot Springs, Va. A former president of Quality Lime Institute, Mr. Miner joined National Gypsum Co. in 1935 as an industrial salesman in the Pittsburgh area. He later became sales manager in industrial lime, and in 1945 was made general sales manager of the industrial division.

Aubrey Smith Retires

AUBREY SMITH, who has been associated with the cement industry since 1925 as application engineer with General Electric Co., Schenectady, N. Y., has retired after 35 years of service. A native of California, Mr. Smith graduated from Stanford University as an electrical engineer. He joined General Electric Co. in 1920 as a testing engineer on apparatus control, and since 1925 has supervised the application of many types of electrical apparatus and instruments to cement and crushed stone plants throughout the United States, Canada, West Indies, Central and South America. Author of numerous technical articles, one of which was published in the September, 1953, issue of ROCK PRODUCTS, Mr. Smith has been awarded a patent for automatic braking and control devices on super-synchronous motors. Following extensive travels in this country and abroad, he plans to continue his association with the cement industry as a consulting engineer.

Aubrey Smith

National Gypsum Managers

RICHARD G. TARBELL has been appointed manager of the Bronx, N. Y., plant of National Gypsum Co., Buffalo, N. Y., to succeed Cyrus J. Taylor, who has retired. He was formerly plant manager at Fort Dodge, Iowa, and will be succeeded by John Pitts who has been production superintendent at the plant.

Mr. Tarbell, a native of Alabaster, Mich., attended the University of Michigan, Ann Arbor, Mich., and joined the Savannah, Ga., plant in 1939. In 1949 he transferred to the Baltimore plant where he remained until 1953, leaving there as assistant plant manager to become plant manager at Fort Dodge, Iowa. Mr. Taylor was born in Rochester, Mich., and graduated from the University of Michigan. He joined the Portsmouth, N. H., plant in 1936, and has been manager of the Bronx plant for the past 13 years.

Mr. Pitts, a native of Phillipsburg, N. J., graduated from Lafayette College, Easton, Penn., and joined the Saltville plant in 1939. He transferred to Fort Dodge as quarry superintendent in 1945. After serving five months in 1954 at the Milford, Nova Scotia, plant of National Gypsum (Canada) Ltd., he returned to Fort Dodge as production superintendent.

Receives Service Award

DOUGLAS E. PARSONS, chief of the Building Technology Division of the National Bureau of Standards, Washington, D. C., has been awarded the Gold Medal for Exceptional Service in the field of building research by the Department of Commerce. Secretary of Commerce Sinclair Weeks presented the award. A graduate of Cornell College, Mount Vernon, Iowa, Mr. Parsons joined the Bureau in 1924 as an associate engineer, and has been chief of the Building Technology Division since its formation in 1947. Previously he was chief of the Masonry Construction Section and the Mineral Products Division.

Mr. Parsons has received numerous other awards, among them being the Wason Medal from the American Concrete Institute for research, the Lindau Award for outstanding work in the field of reinforced concrete de-

sign, and the Award of Merit for outstanding service from the American Society for Testing Materials.

A past-president of the American Concrete Institute and a past-chairman of the Building Research Council, Mr. Parsons is a member of a number of professional associations, including the American Society of Civil Engineers and the Highway Research Board.

Heads Maule Industries

M. F. PAFFORD, executive vice-president and treasurer of Maule Industries, Inc., Miami Beach, Fla., has been elected president to succeed J. H. Buchanan who has resigned but remains as a member of the board and president of Chemical Research Corp. Max Orovitz, a director who has also been serving as secretary, has been elected vice-chairman of the board, and J. Lee Telford has been promoted from assistant secretary to secretary. Mr. Pafford was also elected treasurer, and F. K. Foster was re-elected vice-president. Maurice M. Orovitz, Neilson Jones and Frank J. Salich were appointed assistant vice-presidents; Don Kelly, assistant treasurer; and Terry Maule and John Marline, assistant secretaries.

A.C.I. President

CHARLES S. WHITNEY, partner in the consulting engineering firm of Ammann & Whitney, Milwaukee, Wis., and New York, N. Y., was elected president of the American Concrete Institute, Detroit, Mich., at the 51st annual convention held recently in Milwaukee, Wis. He succeeds Prof. Charles H. Scholer, head of the Department of Applied Mechanics at Kansas State College, Manhattan, Kan. Walter H. Price, head of the engineering laboratories of the U. S. Bureau of Reclamation in Denver, Colo., was elected vice-president for a two-year term.

General Sales Manager

DON MARTIN, manager of the Chehalis, Wash., ready-mixed concrete plant of Graystone Concrete Products Co., Seattle, Wash., has been appointed general sales manager of all divisions of the company except the silo division, in addition to his duties as manager of the Chehalis plant. Jim Short, formerly accountant at the Centralia plant, has been appointed to the sales staff of the silo division.

Officers Re-elected

C. G. SHRINER has been re-elected president of the Cunard-Lang Concrete Co., Columbus, Ohio. Other officers re-elected are J. Paul Batterson, vice-president and general manager, and Frederick R. Lang, secretary-treasurer. In addition to the officers, Mrs. Clara Lang and Eva Lang were elected to the board of directors.

Association Director

JAMES CULBERTSON, sales manager of Crandall Concrete Products, Inc., Benton Harbor, Mich., has been elected a director of the newly formed Michigan Septic Tank Association at a recent meeting at Michigan State College, East Lansing, Mich.

P.C.A. Field Engineer

HARVEY J. FIELD has been appointed field engineer in the Louisville, Ky., office of the Portland Cement Association, Chicago, Ill. He was formerly associated with the Kentucky State Highway Department.

Service Bureau Manager

ALMER F. MOORE has been appointed manager of the service bureau of Penn-Dixie Cement Corp., New York, N. Y., succeeding Joseph H. Chubb, who has retired. Mr. Moore has been assistant manager of the bureau since 1935.

U.M.A. Vice-President

PAUL L. NUTT, sales manager, Smithwick Concrete Products, Portland, Ore., has been elected vice president of the Unit Masonry Association of Oregon.

OBITUARIES

CAPT. SAMUEL T. GINNETT, one of the founders of the Whidbey Island Sand and Gravel Co., Bellingham, Wash., which later merged with the Bellingham Builders Supply Co., passed away May 3 after a long illness. He was 82 years old. Capt. Ginnett was born in Indiana but had followed the sea and the waters of the Northwest Pacific from early youth. He was a master mariner and for many years was master of the tug Famour, built by the Whidbey Island Sand and Gravel Co. for towing sand and gravel barges.

CHRISTIAN YEGLE, who helped supervise and put in operation the Pretoria Portland Cement Co. plant in Pretoria, South Africa, died May 11 after a short illness. He was 69 years old. In 1902 Mr. Yegle was sent by Allis-Chalmers Manufacturing Co. to Pretoria to help build the first cement plant in South Africa. Returning to the United States in 1918, he joined the Edison Cement Co., formerly in New Village, and then the Alpha Portland Cement Co., Martins Creek, Penn. He was a cement burner for Hercules Cement Corp., Stockertown, Penn., for 28 years until his retirement two years ago.

HECTOR ESCHENBRENNER, founder and former president of the Universal Concrete Pipe Co., Columbus, Ohio, died May 18 at the age of 60. He had retired a year ago for reasons of health and founded the Universal Realty and Investment Corp. Mr. Eschenbrenner moved the headquarters of Universal Concrete Pipe Co. from West Virginia to Columbus in 1932. He operated 26 plants in the East and South.

WALTER F. LAUER, president of the Rochester Lime and Cement Corp., Rochester, N. Y., died May 26 at the age of 81. The company was founded in 1870 by Mr. Lauer's grandfather, Frederick C. Lauer, Sr. Mr. Lauer became associated with the firm in 1908 and was made president in 1912. Two of his sons, Frederick C. and Franklin A. Lauer, are members of the firm.

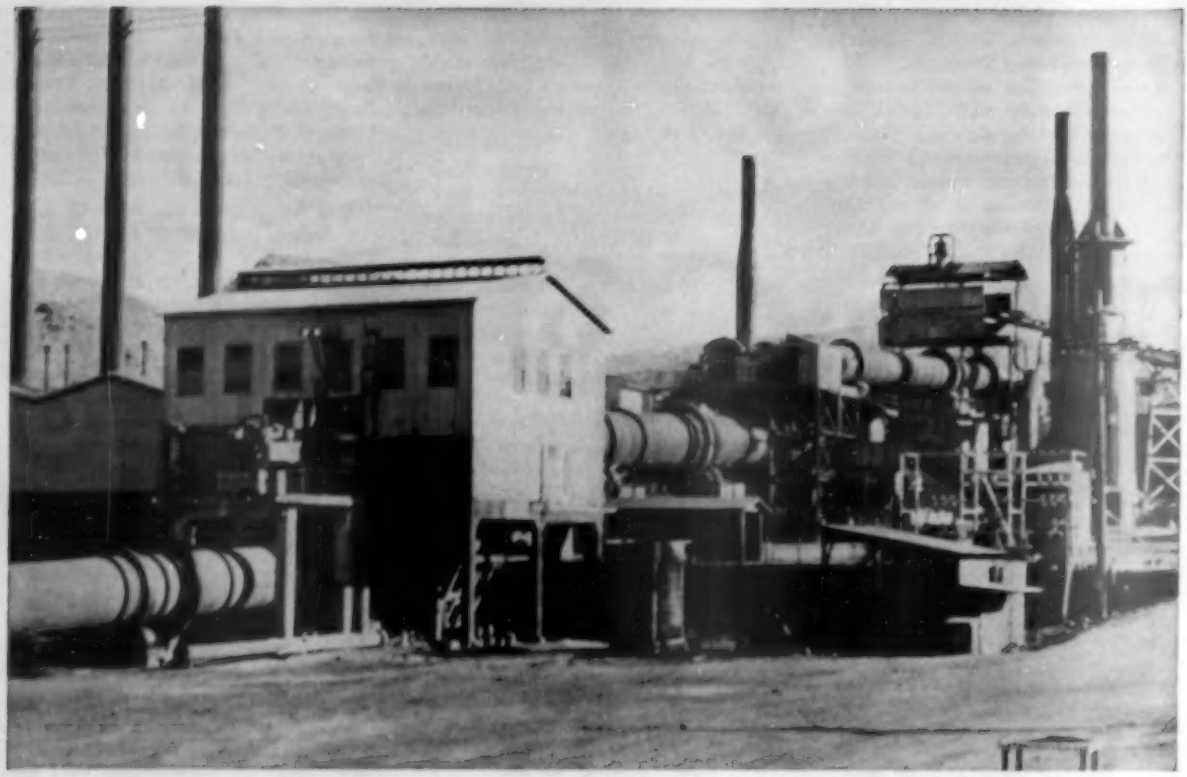
HIRAM W. BARNES, sales manager for Dolomite Products Co., Inc., Rochester, N. Y., died May 24 after an illness of six months. He was 66 years old. Mr. Barnes was a former president of the New York State Crushed Stone Association and a member of the New York State Bituminous Concrete Producers Association.

WILLIAM J. SWEGMAN, builder of cement plants throughout the world, died April 29 at the age of 68. He spent two years in Russia from 1930 to 1932, building cement plants and teaching. He also built plants in Spain and rebuilt plants in the United States.

WILLIAM N. BEACH, organizer and former president of Penn-Dixie Cement Corp., New York, N. Y., died at his home in Great Neck, L. I., on May 5. A native of New York City, Mr. Beach was graduated from Yale University, New Haven, Conn., in 1892.

WILLIAM H. SUTTON, chief engineer at the Columbia cement plant, East Fultonham, Ohio, of the Pittsburgh Plate Glass Co., Pittsburgh, Penn., died suddenly on May 18. He was 48 years of age and had been associated with the plant for 25 years.

HARRY J. LARKIN, SR., one of the founders of the Rock Island Sand and Gravel Co., Rock Island, Ill., died April 29 following a short illness. He was 74 years of age and had been secretary and general manager of the firm since its organization in 1902.



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INDUSTRY NEWS

Cover Picture

ON THIS MONTH'S COVER is a view of the rock wool batt production line in the recently completed plant of Texas Rockwool Corp., at Belton, Texas, about 130 miles south of Dallas. This plant is unique in that it is one of the few plants producing rock wool by the spinning process. The plant employs a vertical water-jacketed cupola for melting the raw materials, and uses a combination of spinning discs and high pressure steam for fiberizing the melt. It is later planned to produce acoustical tile, asbestos and cement composition, boiler lagging and insulations.

3M Research Center Dedicated

MINNESOTA MINING & MANUFACTURING CO., which produces roofing granules, aggregate, and other rock products, dedicated its new research center at St. Paul, Minn., on May 12. The dedication program was held in the Central Research Laboratories, first building to be completed at the center. An electrical products laboratory is also nearing completion.

Featured at the dedication was the world's first cross country transmission of color television on magnetic video recording tape. Developed by the company, the tape records the audio and video portions of the TV signal and reproduces sound and pictures immediately on playback.

Concrete Proportioning Tables

NATIONAL SLAG ASSOCIATION, Washington, D. C., has published a 40-page booklet "Concrete Proportioning Tables." The tables, developed and approved for circulation by the N.S.A. Technical Committee headed by Fred Hubbard, association engineer, are broad enough in scope to serve practically all users of concrete.

Hercules Loan For Expansion

HERCULES CEMENT CORP., Philadelphia, Penn., is asking shareholders at a special meeting called for July 13 to authorize borrowing $5 million for modernizing and expanding its Stockertown, Penn., plant. The program will include replacing four small kilns by a large kiln, which will boost the annual capacity to 3,300,000 bbl. Modern material handling and milling facilities will also be added. The building program is expected to be completed in 1956.

For 12 months ending March 31, Hercules reported a net income of $1,482,975 or $6.97 per common share on sales of $10.7 million. The previous 12-month net income was $808,953 or $3.80 per share on sales of $9.1 million.

Gravel Plant Being Built

ROSS CONCRETE AND MORTAR CO., Huntington, W. Va., is building a $400,000 sand and gravel plant adjacent to the Ohio River at Apple Grove, Ohio. The plant will feature virtually push-button control with a minimum of labor. Forty acres of reserves have been purchased and an additional 161 acres are under option. The finished product will be shipped in barges to the company's retail plant at Huntington and to other points.

Japanese Cement Boom

POSTWAR RECONSTRUCTION IN JAPAN has lifted an already strong cement industry into a boom, with 1954 output reaching 10,675,000 tons — a gain of 22 percent over 1953. Exports amounted to 904,000 tons valued at $20 million. Addition of 10 kilns in the past year has increased capacity almost 10 percent. About 70 percent of the plants use the dry process, but the wet process is gaining in favor.

Portland Cement Production

THE PORTLAND CEMENT INDUSTRY produced 22,409,000 bbl. of finished portland cement in March, 1955, as reported by the Bureau of Mines. This was an increase of 12 percent over the March, 1954, figure. Mill shipments totaled 22,604,000 bbl., 21 percent more than in March, 1954, while stocks were 8 percent less than on the same date a year ago. Clinker production during March, 1955, totaled 24,318,000 bbl., an increase of 10 percent from the March, 1954, figure. The output of finished cement during March, 1955, came from 156 plants in 37 states and Puerto Rico. During the same period of 1954, 20,097,000 bbl. of finished portland cement were produced.

New Illinois Quarry

RAID BROS. CONSTRUCTION CO., Denmark, Iowa, opened a limestone quarrying operation at an 8-acre site near Biggsville, Ill. The plant consists of a portable primary crushing unit and a combined secondary crushing-screening unit, which are operated by diesel and diesel-electric power.

Pallet For Handling Slate

TATKO BROTHERS SLATE CO., INC., Middle Granville, N. Y., has patented a new, lightweight pallet for handling slate. The pallet utilizes the product itself as vertical end supports against which the material is tightly stacked on end and locked in place. This is accomplished by providing pockets at the ends of the pallet.

Newly developed pallets for handling slate

Ideal Cement to Spend $55,000,000

IDEAL CEMENT CO., Denver, Colo., has approved a $55 million expansion program which will boost its annual production capacity about 50 percent —from 21,500,000 bbl. to 31,000,000 bbl. The program calls for the building of four new plants immediately adjacent to existing plants, the expansion of six other plants, and the purchasing of additional marine equipment for the Gulf Coastal area. The company is also considering an expansion program for its Spokane, Wash., plant purchased last September.

The new plants and expected costs are as follows: Houston, Texas, $8 million; Ada, Okla., $6.5 million; Trident, Mont., $6 million; and Superior, Nebr., $5 million. Plants to be enlarged with expected costs are Redwood City, Calif., $6 million; Mobile, Ala., $5.5 million; Boettcher, Colo., $4.5 million; Baton Rouge, La., $3.5 million; Okay, Ark., $3.5 million; and New Orleans, La., $1.35 million. The new marine equipment will cost $850,000.

Since the end of World War II, Ideal has spent $44 million on expansion and improvement programs at its 14 plants located in the U. S. In 1954, sales totaled $58.9 million, compared to $53 million in 1953. Along with new expansion program, the company has raised its quarterly dividend from 35¢ per share to 40¢, effective June 30.

Bessemer To Expand Cement Capacity

BESSEMER LIMESTONE & CEMENT CO., Youngstown, Ohio, has begun construction of a $3,600,000 expansion project at its cement plant in Bessemer, Penn. The expansion will include a 12- x 450-ft. kiln and auxiliary units, and additional raw grinding facilities, dust collectors, and cement storage capacity. The new equipment is expected to be placed in operation during the spring of 1956.

The company also declared a dividend of 50¢ a share on preferred stock payable July 1 (on stock of record June 15) and on common stock payable June 13 (on stock of record June 1). Frank B. Warren was re-elected president of the firm.

African Cement Plant

NIGERIAN CEMENT CO., a new concern, is building a 100,000 ton per year cement plant at Nkalagu, Nigeria; it will be the first cement operation in this central African country. Tunnel Portland Cement Co., Ltd., of Great Britain is managing agent for the new undertaking. F. L. Smidth and Co. will supply the machinery and be consulting engineer for the erection. The plant will supply about one third of Nigeria's present cement consumption. Nkalagu was chosen as the plant site because of its proximity to extensive limestone and coal deposits.

Gypsum Plant in Arizona

UNION GYPSUM COMPANY, Phoenix, Ariz., is building a gypsum wallboard plant which is scheduled for operation in September, 1955. The plant will furnish a complete line of wallboard, sheathing, and plaster for dealers in Arizona, California, New Mexico, and West Texas. Officers of the company are Carlton M. Rogers, president; M. R. Prestridge, vice-president; and Ray L. Moore, secretary-treasurer. A. H. Brunner is chief engineer, C. R. Langford, construction superintendent, and A. A. Binney, Jr., purchasing agent.

Repeal Holland Amendment

THE HOLLAND AMENDMENT, which denied Agricultural Conservation Program payments to any farmer who exceeded his acreage allotments, was repealed by Congress late in May. The repeal bill (HR 1573) was passed by a senate vote of 49-35, and signed by President Eisenhower on May 23. Much of the opposition to repeal was voiced by the American Farm Bureau Federation, whereas Secretary of Agriculture Benson, Under Secretary Morse, and Assistant Secretaries McConnell and Paterson, all maintained that complete repeal of the Holland Amendment was necessary for the proper administration of the A. C .P.

Lehigh Increases Florida Reserves

LEHIGH PORTLAND CEMENT CO., Allentown, Penn., has purchased nearly 3000 acres of land northwest of Ormond Beach, Fla., for $290,000. The company had owned 16,000 acres of land in the area and has now provided added reserves of coquina shell for use at the Bunnell cement plant. The purchase was in connection with the company's present expansion program at Bunnell.

Plans Expansion

SOUTH DAKOTA CEMENT PLANT plans to install a new kiln to replace two older kilns at the state-owned mill in Rapid City. The new kiln will increase the annual capacity 900,000 bbl. (to 2,250,000 bbl.). Ten new silos, costing $419,000, are now under construction.

Moves Crushed Stone Plant

THE ANDERSON-OXANDALE CO. has moved its crushed stone plant to Pryor, Kan., as announced by Harold H. Oxandale of Herrington, Kan. The plant has a capacity of 1200 to 2000 tons of crushed stone daily, producing roadstone, agricultural limestone, concrete aggregate, etc.

To Build Expanded Shale Plant

NORTHERN LIGHTWEIGHT AGGREATES, INC. is planning to build a $500,000 expanded shale lightweight aggregate plant at Cohoes, N. Y. Cohoes was selected for the plant site because of its proximity to a good shale deposit and to large Eastern markets which can be served by railroad, highway, and barge canal facilities. Officers of the new corporation are Willis F. Bronkie, president; Joseph J. Fox, vice-president; Alfred D. Clark, secretary; and Arnold Cogswell, treasurer.

Canadian Gypsum Expansion

WESTERN GYPSUM PRODUCTS LTD., Winnipeg, Man., is planning a general expansion program this year, according to an announcement by Rt. Hon. Lord Belper, chairman of British Plaster Board Holdings of London, England. This organization bought the gypsum company last year for about $3,000,000. Western has properties in Manitoba, Alberta, and British Columbia.

Sells Quarry

THE ERVIN STONE CO. has sold its stone quarry east of Cotton Falls, Kan., to Mr. Walker of Colorado Springs, Colo. The new owner plans to move the quarry equipment to Colorado Springs for quarry operations there, and is discontinuing operations at Cottonwood Falls. The quarry had been operated for three years by Leo LaLogue.

Ideal Increasing Storage

IDEAL CEMENT CO., Denver, Colo., is erecting fifteen 95- x 25-ft. cement silos and additional truck and barge loading facilities at its New Orleans, La., plant. Rust Engineering is the contractor.

Pavement Yardage

AWARDS OF CONCRETE PAVEMENT for the month of May were listed by the Portland Cement Association as follows:

	Sq. yd. Awarded During May, 1955
Roads	3,304,915
Streets and alleys	4,212,645
Airports	1,242,113
Total	8,759,673

National Gypsum Sales

NATIONAL GYPSUM CO. sales rose to $33,572,033 during the first quarter of 1955, more than 20 percent above the similar period last year. This was the highest for any quarter in the company's history.

Iowa Agstone Group Meets

IOWA AGRICULTURAL LIMESTONE ASSOCIATION, INC., Des Moines, Iowa, held a special meeting April 5 and 6 to discuss ways of increasing agstone sales. Approximately 30 limestone producers heard talks by Clint A. Allen, association executive - secretary, Robert M. Koch, National Agricultural Limestone Institute executive - secretary, and several state and college agricultural officials. Among the latter were Dwight W. Myer, chairman of the Iowa ASC committee, C. C. Glenn, ASC administrative officer, Dewey Cornell, ASC program specialist, Othie McMurry, secretary state conservation, and Dr. W. H. Pierre, head of the Agronomy Extension Division of Iowa State College.

The main discussion centered around the mandatory soil test which is required before Iowa farmers can obtain ACP funds for agstone. Arguments were presented by the limestone producers for easing this restriction, but the state ASC officials and college agronomists felt that the regulation should not be changed. Mr. Koch reported that several states recently adopted a plan of allowing farmers 2 tons of agstone per acre upon request, without requiring the soil test; for a higher rate of application, however, the soil test is required to prove the need.

One important outcome of the meeting was the decision for the limestone producers to meet again with the state ASC committee and the college agronomists in order to discuss common problems. Mr. Allen urged producers to promote good customer relations. One step would be to help farmers every way possible with soil testing, even to the extent of delivering the soil samples to the local laboratory. He also thought that the industry could help to promote the setting up of soil testing laboratories in the 29 out of 99 counties which lack these facilities.

Agstone Usage Expected to Increase

NATIONAL AGRICULTURAL LIMESTONE INSTITUTE, Washington, D. C., forsees a probable reversal beginning ing 1955 in the seven years trend of declining use of agstone. Indications of increased usage are:

1. Greater public and official awareness of the need for expanded soil conservation efforts. Tangible evidence is the $250 million A.C.P. appropriation for 1956, which is $75 million higher than the amount requested by the Secretary of Agriculture.

2. A.C.P. modifications in many states. Fifteen states have eliminated the mandatory soil test or permit a practical alternative, such as two tons of agstone per acre.

3. Farm income has probably reached its lowest point and should rise within a year.

4. High levels of business prosperity, a sound stock market, increasing private income, and rising population point to greater demand for farm products.

5. The agstone industry is aggressively stepping up its promotional efforts.

6. Due to over-production, drought, and other factors, many acres are lime deficient to a dangerous degree.

Drivers Manual

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington, D. C., has published a new, attractive Sand and Gravel Driver's Manual. The manual covers the fundamental points of good relationships between the employer and the truck driver, and between the driver and the public. It emphasizes the great responsibility and importance of the driver's role in building and maintaining good public relations. The story is driven home by means of amusing cartoons and brief messages written in the driver's own language. The 40-page booklet is priced at $1 per copy (for 25 copies or less) and $.75 for each additional copies. The company name can also be imprinted for an additional charge of $5 (for 25 copies) and $.10 each for imprinting of additional copies.

Turkish Cement Industry Expands Production

THE TURKISH CEMENT INDUSTRY in 1953 completed plans for building 21 new cement plants in Turkey at an expected cost of $89,290,000. Three plants will start production in 1955, ten in 1956, and the remainder in 1957. The estimated 1957 production will be 2,500,000 tons, compared to an output of over 1,000,000 tons in 1954.

Lime Producer Adds Reserves

STANDARD LIME AND STONE CO., Baltimore, Md., has purchased several tracts of land in the Falling Waters District near Martinsburg, W. Va., from the J. E. Baker Co., York, Penn., for $100,000. The property, totaling about 300 acres, will be held by Standard as part of its limestone reserve.

Coming Conventions

August 8-10, 1955—
National Cinder Concrete Products Association, Summer Meeting, Hotel Chalfonte - Haddon Hall, Atlantic City, N. J.

September 19-24, 1955—
National Industrial Sand Association, Fall Meeting, The Greenbrier, White Sulphur Springs, W. Va.

October 10-13, 1955—
American Mining Congress, Annual Convention, Las Vegas, Nev.

October 17-21, 1955—
National Safety Council, 43rd Congress and Exposition, Conrad Hilton, Congress, Morrison and La Salle Hotels, Chicago, Ill.

January 23-25, 1956—
National Concrete Masonry Association, 36th Annual Convention, Roosevelt Hotel, New Orleans, La.

February 13-16, 1956—
National Sand and Gravel Association, 40th Annual Convention and Biennial Show, Conrad Hilton Hotel and Chicago Coliseum, Chicago, Ill.

February 13-16, 1956—
National Ready Mixed Concrete Association, 26th Annual Convention and Biennial Show, Conrad Hilton Hotel and Chicago Coliseum, Chicago, Ill.

February 20-22, 1956—
National Crushed Stone Association, 39th Annual Convention and Exposition, Conrad Hilton Hotel, Chicago, Ill.

HINTS AND HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

Keep Over-size Out of Fines

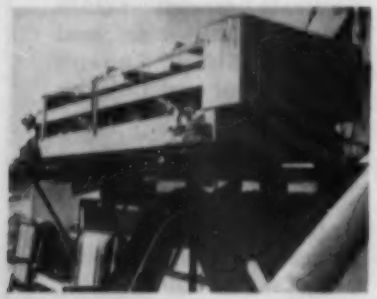
A HIGH-CALCIUM LIMESTONE PRODUCER has a market for the minus ½-in. crushed limestone. The bulk of the plant-run material is stockpiled

Minus ½-in. material from the screening plant is re-screened in the plant in the background, taking out any plus ½-in. and discarding it

over a reclaiming belt conveyor tunnel by the overhead conveyor system shown in the illustration. Material is intended to be all minus ½-in., but to insure that no oversize gets into the finished product a re-screening plant, shown in the background, was built. As the plus ½-in. stone is very small in amount, it is discarded. Additional material can be ground-stored by by-passing the second conveyor.

Vibration Screen On Wheels

IN CALIFORNIA, supplying road base material is a substantial business. This material is usually minus 1½-in. pit run with enough fines and natural bonding characteristics to help compaction. Often about 6 percent water is added. As a rule, it is a low priced



Screen, mounted on flanged wheels riding on I beams, so that it can be pushed aside when it is not being used

commodity, and when a plant is on production it is a "high ball" operation.

One producer, using a Pioneer portable set-up, has a Symons vibrating screen as a part of the final screening operation that follows scalping. However, when the road base material is being produced, the finish screens are not used; in fact, the finish screen is often mounted on flanged wheels that ride suitable I beams. When not needed, the screen is simply pushed aside.

Convenient Crusher Repairs

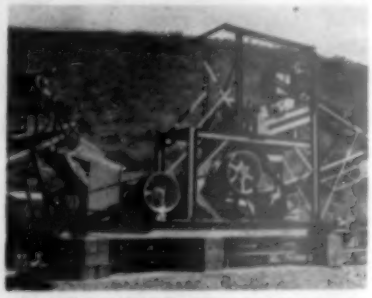
AT A WESTERN SAND AND GRAVEL PLANT two No. 322 Allis-Chalmers crushers are used as final reduction units. The crushers have been placed

Curved "I" beam and chain blocks and "crawl" facilitate repairs

parallel to and alongside bins. A truckway passes under the bins. To enable the repair crew to get spare parts to the crusher, a curved steel "I" beam has been installed as shown in the illustration. A pair of chain blocks and "crawl," hand-operated, ride the "I" beam. This assembly permits parts to be loaded or unloaded from trucks using the passage-way under the bins.

Portable Gravel Plant

PORTABILITY in a new western sand and gravel plant, using a 10- x 36-in. Cedarapids primary jaw crusher and a Waldrip set of Roto corrugated rolls, was achieved by mounting the entire assembly, including a small screen, on two heavy I beams, as shown in the illustration. Both crushers unload to the same belt conveyor which is under the assembly and between the two



Crushing and screening assembly mounted on steel I beams for portability

steel skids. The plant now operates dry but may be equipped for washing.

Flexible Storage for Dry Fines

A CRUSHED LIMESTONE PRODUCER uses a 42- x 48-in. Pioneer overhead eccentric jaw crusher. This is one of the largest crushers of its type in the world and has a large capacity.

Throughs from the crusher are conveyed to a 5- x 8-ft. Tyrock two-deck scalping screen, operated dry, with a ¼-in. wire cloth lower deck. Fines are moved by belt conveyor to the storage system shown in the illustration. Belt conveyor (A) may dump the material to ground storage or send it to the steel storage tank for loading trucks. Material stored on the ground is reclaimed by the inclined bucket elevator to the left of the steel storage silo.

Belt conveyor (A) can dump the material to ground storage or send it to the steel storage tank for loading trucks. Material stored on the ground is reclaimed by the bucket elevator

Signal Light Controls

USE OF SIGNAL LIGHTS can help cut down the plant superintendent's work and worry. The two illustrations, taken at different plants, shows how these plants use the lights.

One illustration shows four electric lamp bulbs mounted near the top of a

Signal lights at truck hoppers serving plant show height of aggregate in hopper

plant. Bin level indicators were located in the bins below. When a bin became nearly full, the proper light would flash and the superintendent in

Four electric lights located near top of plant, connected with bin level indicators, permit superintendent to check condition of bins at a glance

his office some distance away could see which bin was becoming full and correct the situation. The second installation was at a ready-mixed concrete batching plant. The operator, in this case, could see at a glance what the conditions were at the truck hoppers serving the plant.

Lift Truck Pulled to Job

A WESTERN CONCRETE PRODUCTS MANUFACTURER has a contract to supply 50,000 cored concrete panels, each 2 ft. wide and up to 10 ft. long. The haul to the job, located in a desert area, is about 110 miles from the plant. The panels are placed on light spacers on the flatbed of a semi-trailer Mack tractor combination. Small items are on pallets. Each full pallet weighs

Lift truck coupled to semi-trailer and pulled to job site

about 400 lb. To expedite unloading of the building units at the job-site, a lift truck is coupled to the end of the semi-trailer. At the job, the lift truck, shown in the illustration, is uncoupled and is used to unload the semi-trailer and place the building units where the contractor desires them.

"Back Scratcher" for Caving

AT A CALIFORNIA sand and gravel deposit, there is just enough clay in the raw material so that it acts as a binder, preventing the bank from caving down to the shovel. The bank is 200 ft. high. A "back scratcher" is used to cave down the high bank.

This tool is a heavy flat section of steel with side claws as well as claws or ribs fastened to both faces of the scratcher. A No. 108 Northwest dragline raises and lowers the scratcher along the face of the pit so that the 2½-cu. yd. Northwest shovel, which may be seen at the bottom of the pit, gets an adequate supply of gravel. The furrows in the face of the pit testify to the stable qualities of the bank, however, cave-ins have occurred in the past that were superficial and not severe enough to interfere seriously

Dragline raises and lowers back scratcher

with production. The shovel at the bottom loads to a field hopper, serving a series of belt conveyors that deliver to a surge pile in the pit. Additional belt conveyors take the surge pile material to the screening and crushing plant.

By-passing Fine Material

AT A PLANT HANDLING FINE, DRY, POWDERY MATERIAL, a screw conveyor takes it from a Cedarapids ham-

Screw conveyor (B) takes fine material from hammermill to steel bin. Screw (A) at a steep incline feeds belt conveyor

mermill to a Butler bin. The slope is in the 35 to 40 deg. range. Material in the screw can be by-passed to a belt conveyor and loaded direct to trucks.

Magnet Ahead of Rolls

NORTH OF SAN DIEGO, CALIF., is located a new sand and gravel plant, using Waldrip Engineering Co. corrugated rolls of special design for the

Tramp iron is picked up by magnet ahead of roll crusher

secondary crushing unit. Mounted over the belt conveyor that follows the primary crusher is a stationary magnet that each day "dips back in history" and brings to the surface a bit of the past; mostly old horse shoes. Secondary in importance, but with a more modern tinge, is the collection of beer cans garnered by the efficient scrap iron recovery unit.

NEW MACHINERY

Drill Dust Control Unit

KADCO CORP., 36-40 Eleventh St., Long Island City 1, N. Y., has brought out a dust control unit, designed to control silica-bearing dust in drilling and quarry operations. It may be used with either four jackhammers or two wagon drills, and has a turning radius of 14 ft. Dust and chips are said not to accumulate at the cutting edge while drilling, as the unit continuously withdraws the material. This feature eliminates regrinding and pulverizing the accumulated cuttings which build up before "blow-back." Three gravity flow side dump openings unload the chips and dust, and an external shaker handle permits filter bag de-dusting without opening the machine. The unit may be mounted on a jumbo type tractor, air compressor, drill rig combination, and it is available with either gas, diesel or electric motor drive. The unit offers greater protection to the drill operator.

Dual-Deck Vibrating Screen

SYNTRON CO., Homer City, Penn., has brought out Model 2-B Dual Deck Balanced vibrating screens for either suspension or floor mounting, and can be installed horizontally or declined. The dual decks operate in reverse motions, and guide links allow the decks to follow the eccentric drive movements counter-balancing each other. The drive motors may be mounted on an outrigger frame on either side of the frame of floor mounted screens, or mounted above the top deck. On suspended type screens, the drive motor is mounted above the top deck, or it can be separately mounted below and on either side of the bottom deck in this arrangement.

Both top and bottom screens can be equipped with high tensile steel, phosphor bronze, monel or stainless steel wire cloth of No. 22 to No. 4 mesh, woven wire with ½ to ¾ in. openings, flanged lip screens or perforated plate with ¾ to 3 in. openings, ¼ in. mesh and larger de-watering stainless steel wire or bar screens. Both screens are started by a 5-hp. motor.

Classifier—Separator

SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Ave., Los Angeles 58, Calif., has incorporated tangential discharge spouts on the Sweco vibrating screen separator, replacing the rectangular shape spouts formerly used, which were set at right angles to the screen deck. The tangential spouts are designed to permit efficiency and speed to develop in the material as it spirals out on the screen and through the discharge at the frame wall. The 48-in. dia. and 18-in. dia. separators incorporate the tangential spout design.

The separators utilize a gyratory motion provided by a vertically mounted motor. Material fed to the screen surface is separated in a vertical flow pattern, and weights attached to the motor shaft above and below the motor impart a vibratory motion to the entire screen frame assembly mounted on springs. The weights may be adjusted to increase or decrease the screening rate of the material, depending on the nature of the material being classified or separated with this equipment.

Horizontal Loading Attachment

LINK-BELT SPEEDER CORP., Cedar Rapids, Iowa, has brought out the Excaloder loading attachment which adapts the heavy-duty 1-cu. yd. LS-98 shovel-crane for horizontal, straight-line loading operations. It is interchangeable with the shovel, hoe, dragline, clamshell or crane attachments, and features low overhead clearance. The standard mast requires 15 ft. 10 in. clearance height. An optional low mast with a minimum clearance height of 11 ft. 3 in. is also available. Maximum dumping height, with stick extended at 45 deg., is 16 ft. 11 in., and with stick retracted, is 11 ft. 4 in. The loading attachment is operated by the shovel-crane Speed-o-Matic control equipment.

Independent chain crowd arrangement provides positive crowding and retracting, reducing maintenance and down-time. The shovel-crane can also be equipped with independent swing and travel. This feature can save time spent shifting from swing to travel.

Conveyor Belt

HEWITT-ROBINS INC., Stamford, Conn., has developed a conveyor belt, reinforced with a synthetic fabric called Super Raynile, to transport bulk materials over long distances and up steep grades. It is said to be pliable and flexible despite its high strength, and is available in various widths up to 72 in., and in thicknesses ranging up to 15 plies.

Earthmovers

CATERPILLAR TRACTOR CO., Peoria, Ill., introduced several new earthmoving machines at a press conference and preview held in Peoria on June 2. The conference, marking the start of the Caterpillar Exposition, was attended by over 100 editors of the trade press, who toured the company's diesel engine works and witnessed machinery demonstration. The exposition, which lasted over two weeks, was witnessed by about 500 domestic and export distributors and field representatives.

Among the new models previewed were the DW21 (Series C) and DW20 (Series E) rubber-tired tractors, both featuring more horsepower and major design changes over the DW21 and DW20 tractors. The tractor's diesel engine, rated at 300 hp. at 1800 r.p.m., has 805 cu. in. piston displacement, a 5⅛-in. bore and 6½-in. stroke, and a turbocharger. The design includes a new block, crankshaft, connecting rods, pistons, head, and a more accurate valve train, redesigned fuel system, and paper-type fuel filters. Wide-base (29.5 x 29:00) tires with rock-type tread are used. Direct electric or gasoline starting is available. Speeds for the Series E tractor range from 2.8 to 32.1 m.p.h., and for the Series C tractor from 2.3 to 20.5 m.p.h.

Caterpillar also has designed two matching scrapers—the No. 456 scraper for the Series E tractor and the No. 470 scraper for the Series C tractor (illustrated above). Both units have wider and longer "lowbowl" design; struck capacity is 18 cu. yd. (heaped 25 cu. yd.). This shallow design is said to permit faster loading due to less lifting effort involved. The scrapers also have a high lift apron, higher ground clearance, wide base tires, and a larger pusher block compared to older models.

Another model is the DW15 (Series C) tractor, with several major design changes. These include a 186-hp., 5⅛- x 6½-in. engine and a transmission case which assures positive lubrication under adverse operating conditions. This unit is equipped with the No. 27 cable control for more positive scraper response and increased cable control clutch and brake life.

The company also has developed the No. 12 motor grader equipped with an oil clutch similar to that used on its tractors. Advantages of the oil clutch include longer wear of clutch facings, reduced clutch pedal effort, and less slippage due to less overheating.

Other models introduced were the No. 933 and No. 955 Traxcavators and the No. 583 pipelayer. The No. 933 (mounted on the D2 tractor) and the No. 955 (mounted on the D4 tractor) have oil clutches and have a 40 percent bucket tiltback.

Water Cooled Compressor

GARDNER-DENVER CO., Quincy, Ill., has announced a rotary, water-cooled, portable air compressor, designated the Rotary 600, with a capacity of 600 cu. ft. per min. It is reported to provide reliable operation under severe weather conditions, ranging from 40 deg. F. below zero to 115 deg. F. above. The water-circulating system is automatic. In cold weather, warm water from the engine heats the compressor oil system before the compressor starts to turn, assuring normal oil flow. A hydroshift clutch is provided between the engine and compressor so that the compressor load may be disengaged for engine starting during cold weather. A Thriftmeter is incorporated, which keeps operating speed of the unit in line with air demands. The two-stage, multivane compressor has two parallel cylinders cast in one block. The unit is 5 ft. 11 in. wide, 8 ft. high, and 11 ft. 2 in. long. An automotive-type running gear provides a short turning radius of 14 ft. The compressor is powered by a General Motors diesel engine, Model 6-71, with operating speed rating of 1800 r.p.m.

Off-The-Road Tires

THE B. F. GOODRICH CO., Tire & Equipment Div., Akron, Ohio, has announced a line of wide base, low-pressure, tubeless off-the-road tires, designed to provide maximum flotation in soft dirt and sand and under operating conditions where flotation, as well as traction, is a major operating problem.

Vibrating Screen

HEWITT - ROBINS, INC., Stamford, Conn., has announced the "Hi-G" vibrating screen for screening and sizing bulk materials. The screen frames are mounted on a system of rubber and steel springs. Controlled resonance is induced by a relatively small mechanical exciter which produces vibrations with added "kick," to eliminate screen surface clogging. All vibration is contained within a dynamically balanced system designed to reduce energy losses, and permit operation with smaller and lighter drives and motors. The screen is available in various sizes, ranging in dimension from 4 x 10 ft. to 6 x 28 ft.

Triple Duty Drilling Unit

INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y., has introduced the Triple Duty Drillmaster, a self-contained drilling unit with a wide range of hole sizes and drilling depths. It incorporates three drilling methods: in the first combination, it utilizes a Depth-Master or "down the hole" drill for deep blast holes up to 6 in. in dia.; the second combination is available with a Power-Master heavy-duty hammer drill for 4¼-in. holes; and the third combination, with the Roto-Master rotary drill for rotary drilling of holes up to 6¼ in. in dia. Any one or all three of the drilling combinations may be used. Features claimed for the unit include: an easily lowered tower, providing long steel changes; positive chain feed, a dust collector, and a 600 c.f.m. rotary compressor; a motor driven crawler assembly, "out-in-front" full vision drilling position, etc.

Close-up of hydraulic packing machine on the batt production line

SPINNING Process for Manufacture of Rock Wool Products

• New plant of Texas Rockwool Corp., Belton, Texas, uses spinning disc equipment for rock wool production. Pneumatic machine packs batts in bags

By BROR NORDBERG

PRODUCTION OF "TEX-SPUN" INSULATION was started on April 30 at a formal dedication of the new plant of Texas Rockwool Corp. Location of the plant and headquarters of this corporation are at Belton, Texas, which is 130 miles south of Dallas and in the heart of Texas' population.

The plant is one of two mineral wool operations in Texas and both are in Bell county. Its site was chosen to have favorable average freight rates in shipping finished products throughout Texas and into bordering states. Raw materials include basic furnace slag and foundry-grade coke shipped by rail from Daingerfield, Texas, and phosphatic slag delivered from Tennessee. Daingerfield is 200 miles east and a little to the north where Lone Star Steel Corp. has its operations.

The trademark "Tex-Spun" was coined to identify the company's products as manufactured by a Texas company, and to designate that the spinning process is used in their manufacture.

Markets for loose wool as such have fallen off in recent years over the country but the demand for granulated wool as insulation for existing structures and batts for new construction have expanded sharply.

Markets for these two types of wool are to be emphasized and the shipments of batts from the new plant likely will be greater at the outset due to the high rate of new construction. Later, the company has plans to produce a line of industrial insulation

Main building is 81 x 220 ft. At far right, heat generating equipment is outside building

products, among them acoustical tile of wool, asbestos and cement composition, boiler lagging and insulations, and insulating cements.

Plant Design

The production line is typical of most modern practices in the industry, employing a vertical water-jacketed cupola for melting the raw materials, using a combination of spinning discs and high pressure steam for fiberizing the melt and straight-line methods for batt fabrication and the manufacture of granulated wool.

Design of the plant was by men experienced in the production of mineral wool, and incorporates many of the better features of a number of plants studied. The result is a compact plant that stresses simplicity and a minimum of gadgets and automatic devices that have resulted in interruptions to production and high maintenance costs in other plants observed.

No attempt is made to preheat the combustion air injected into the cupola nor to recover preheated circulating water for boiler feed water. Features such as these and the use of insulation, which have been attempted in many plants to reduce operating costs, have not proved practical in the experience of those responsible for design of this plant. Savings in fuel have not been significant, they say, and the abrasive-dust contaminated atmosphere in the boiler and cupola area frequently causes the necessary switch contact points and other related automatic devices required to go out of adjustment.

Built to be completely fireproof, the main plant measures 81 x 220 ft. and was designed for maximum ventilation and the dissipation of heat. All heat-generating equipment, including the cupola and boiler, are outside at one end of the building, leaving most of the floor area inside for storage.

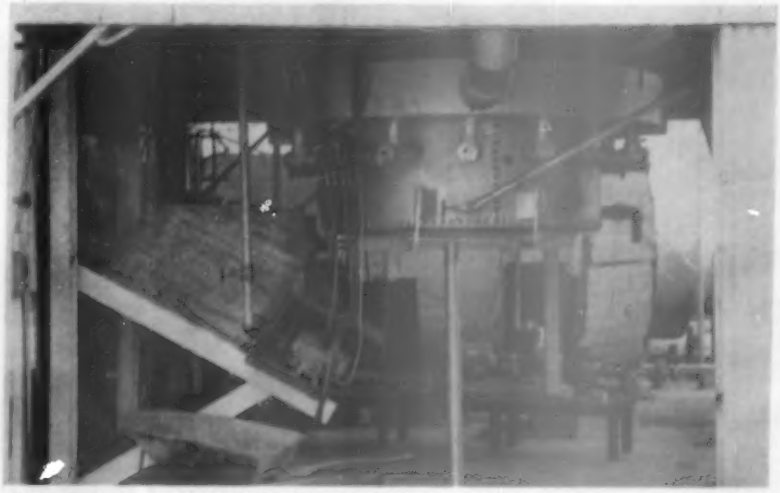
Construction is of steel columns, supporting members and roof trusses, with galvanized iron siding and roof. The entire length of the pitched roof has a cupola-type top which is hinged so that the sides may be raised to exhaust gases and keep the building cool.

Raw Materials

Raw materials are to be fed to the cupola in the ratio of 60 percent phosphatic slag to 40 percent basic slag which will yield an approximate balance between acidic and basic components. Phosphatic slag has a melting point of 750 deg. F. lower than the basic slag (1900 deg. F. compared to 2650 deg.) and also has the advantage of producing a whiter wool. It is sized 1½ to 4 in. Basic blast furnace slag is sized ⅝- x 1½ in. and 1 x 2½ in.

Officers, directors and two of stockholders who were present at dedication. From left to right are Fred H. Guffy, C. E. Laws, Roy Sanderford, president Mark P. Thomas James W. Ward, vice-president Vernon C. Doctorman, W. R. Hastings, Lloyd D. Hobbs, secretary-treasurer J. Fred Patton and Dr. Ralph Krigler

Batt production line with hydraulic packaging machine in foreground. Note roof construction for maximum ventilation



Closeup of lower part of cupola showing blowing tuyeres, and spinning disc, on the left

Heat generating equipment is outside building. Left to right are 54-in. cupola, 150-hp. steam boiler and water tank

Foundry-grade coke is sized from 2 to 4 in.

Local gravel is to be used as a source of added silica (8-10 percent) in the mix, to increase the viscosity and the diameter and length of fiber in the blowing of wool for batt manufacture.

The plant is on a belt line connecting with the main lines of the MK & T and Santa Fe railroads. Both types of slags and the coke are received by rail.

Shot screened out by trommel is collected in hopper at right. Blower is used to move granulated wool to inclined conveyor on left. Additional shot is removed by deflector plate inside housing ahead of conveyor

Hopper bin which has trommel for shot, overhead

A large paved area has been provided for storage in open stockpiles.

Temporarily, drop bottom cars are unloaded by crane but an undertrack belt conveyor is to be provided for use with hoppered-bottom cars. A Hough Payloader will then handle the materials in stockpile and be the means of filling a pivoted charging bucket. This bucket will be weighed on a Toledo platform scale and be discharged into a 24 cu. ft. skip bucket in a pit below the scale. A single-drum hoist raises the skip up an incline to discharge into the top of the cupola. Charging is in alternate layers, with 1800 lb. of raw materials between layers of 350-350 lb. of coke. Fuel ratio is expected to be 5.5 to 6.0:1, using coke of 13,500 B.t.u. heat value.

Cupola-Fiberizing

The cupola is a 54-in. standard vertical type, water jacketed for its full height, with open top and fired under forced draft. Cooling water is supplied by pump from a tank at the rate of 50 g.p.m. Heated water from the jacket is returned into the supply tank by a launder and is re-used with cold water delivered into the tank from a city main.

Combustion air is introduced by pressure fan through 15 tuyeres spaced around the circumference at a level 16 in. above the bottom of the cupola. It is planned, later, to introduce natural gas through tuyeres spaced around the circumference at that level and to use coke for center burning.

Natural gas supply is a nearby main. Gas pressure is reduced from 300 p.s.i. to 15 p.s.i. to fire a 150-hp. Scotch marine-type boiler which supplies the steam for blowing wool. A reducing valve makes a further step-down of gas pressure to 5 p.s.i. for firing the drying ovens on the batt line. Steam requirement is estimated at 9000 lb./hr. and the pressure is 90 p.s.i. at the blowing points. Feed water is supplied from the city main.

Blowing is accomplished by a combination of a Richardson twin-disc patented fiberizer and steam pressure. The melt has a temperature of 2400 deg. F.—2500 deg. F. upon discharge from the cupola notch in a ⅜-in. stream. The stream strikes a water-cooled divider plate which is a short horizontal piece of heat-resistant alloy steel. It has a 90 deg. V cross section. From either end, half of the stream drops to a similar plate, at right angles, from which the drop is to the two discs.

The Richardson assembly consists basically of two discs rigidly mounted 30 degrees from the vertical. Each is about 10 in. in diameter and has a

separate 3-hp. induction motor to drive it at 1200 r.p.m. The discs are slightly concave and the molten stream impinges on the face a little off center. Globules of the melt are thrown out over a raised circumferential lip into the path of high pressure steam introduced through a series of small holes completely surrounding the rim. Fiberizing has just started from the disc and the blowing into fibers is completed by the steam. Wool is blown into a settling chamber of conventional design.

Rate of speed of the discs, their pitch, height of fall of the stream and shape of the discs have been standardized by the designer, based upon field experience, for the particular type and temperature of melt.

This method of two-stage blowing permits conditioning of the melt for best overall performance. The cupola may be operated at elevated temperature for maximum output, and the viscosity be controlled for optimum fiberizing and low proportion of shot. Temperature drop is 350-400 deg. F. after the streams hit the discs. High temperature of the melt keeps the notch washed out and free flowing, thus eliminating one of the troubles common to ordinary cupola operation. Distribution of the fibers is uniform and the even spreading in the blow chamber contributes to uniform thickness of batts.

Fibers have about 15 percent shot by weight as blown and about 80 percent of it is removed by a scalping plate at entrance into the blow chamber. Cupola production is 2 t.p.h.

Petroleum annealing oil is introduced through the steam head to allay dust. A zinc stearate waterproofing is injected through the steam head when producing granulated wool. Binder used in batt manufacture is a synthetic phenol formaldehyde resin. It is introduced on each side, inside the settling chamber, through pipe in front of the steam nozzles to produce an atomized spray in the path of the fibers.

Batt Line

The batt wrapping machine was designed and manufactured by Rock Wool Engineering and Equipment Co., Wabash, Ind. The remainder of the equipment was designed and built by Richardson Service, Inc., Muncie, Ind., and consists of the conventional collecting chamber, cooling section, drying section, and packaging equipment. It is a 6-line production unit with seven longitudinal cutting blades for the production of six 15-in. widths of batt.

A woven-wire endless conveyor supported on perforated slats is the floor in the collecting chamber, moving the

One of large trucks for delivery of "Spun-Tex" insulation products

wool forward for transfer to the batt line, beneath a roller that has adjustable clearance to regulate thickness of blanket. Three downdraft cooling fans with transverse intake ducts across the underside of the collecting chamber conveyor serve to cool the wool to a safe temperature and to settle it on the conveyor. They are No. 33 Power Engineering Co. suction fans rated at 15,000 c.f.m. each and are driven by 15-hp. motors.

A bridge is raised between the end of the conveyor coming out of the collecting chamber and the conveyor continuing on to the batt fabrication line, to by-pass the wool to a belt conveyor for granulating. The entire production line is driven by a 10-hp. motor and Link-Belt PIV variable speed drive. Speed range is 10-30 f.p.m. and selection is varied according to the thickness of batt being made. Also, the speed may be changed to compensate for variations in output from the cupola in order to maintain uniform batt thickness. Remote control for the drive is to be installed for that purpose at the cupola end so that adjustments may be made immediately to conform with cupola changes. A clutch is the means of disengaging the shaft from which the batt line is driven, thus permitting the blow chamber to run independently when granulated wool is made.

A 24-ft. drying oven section is supplied heated air from below by a 15,000 c.f.m. fan to set the binder. The furnace is gas-fired and heated gases are supplied under pressure through a transverse duct below the conveyor and re-cycled before exhaust. Firing of the furnace is automatically regulated by thermocouple to maintain a temperature of 500-550 deg. F. At 600 deg. F. the furnace fire is cut.

Batts are made in thicknesses of 1½, 2 and 3 in. and to three different widths. Longitudinal cutting knives will produce six 15-in. widths, five 19-in. widths or four 23-in. widths of batt. There are four rows of shaft-mounted knives set up for the purpose, and transverse knives cut the batts to length. Top craft paper and vapor barrier covering, both fireproof, are applied from rolls according to standard practice. A printing roll is used to imprint the name of manufacturer and thickness of batt, continuously, on batts made to F.H.A. specifications. Batts are packed into 2 - 50 lb. ply multi-wall paper bags in lengths to 8 ft. folded to 4 ft., by a Rock Wool Engineering and Manufacturing Co. pneumatic packing machine.

Wool by-passed the batt line is put through a threshing cylinder and is then elevated by belt to a trommel screen carrying 6-mesh wire openings for shot removal into a hopper below. Wool coming off the end of the trommel is put on an inclined loading conveyor by a blower. Within the transfer housing, a deflecting plate serves to separate out additional shot. Shot accumulated in the hopper below the trommel is to be returned by belt conveyor into the cupola for re-melting. Granulated wool will be packed in 2.9 and 3.5 cu. ft. sewn paper bags.

A loading conveyor arrangement is to be installed for direct loading in railroad cars and trucks. Contracted trucks may be driven under roof inside the plant for loading. It is anticipated that 85 percent of shipments will be made in trucks over a radius up to 300 miles. The area to be served will cover all of Texas and into Arkansas, Oklahoma, New Mexico, Louisiana and Arizona.

Production started on the day of dedication when company officers, directors and principal stockholders were present. Officials and invited guests, including the editor of ROCK PRODUCTS, were guests of director Fred H. Guffy and Mrs. Guffy at their home for an outside barbecue the night preceding, and the Belton Chamber of Commerce was host for luncheon the day of the dedication. Roy Sanderford, a director of the company and president of the Chamber of Commerce, was master of ceremonies. Doors of the plant were opened to the public. The Belton Journal and the Temple Daily Telegram gave generous space to the occasion and were instrumental in helping to get a good turnout.

The plant was designed and built by men experienced in the industry and its key personnel likewise have a background in the industry. Design and construction were under the general supervision of Vernon C. Doctorman, vice-president of operations, who has been active in the industry for many years. Mr. Doctorman was the promoter of this plant as well as the Tex-Ark Rockwool Corp. at Texarkana which started a new plant in 1947, where he served as a director

(Continued on page 102)

• **Plants designed to recover fines and produce other sizes to meet deficiencies in the available local materials**

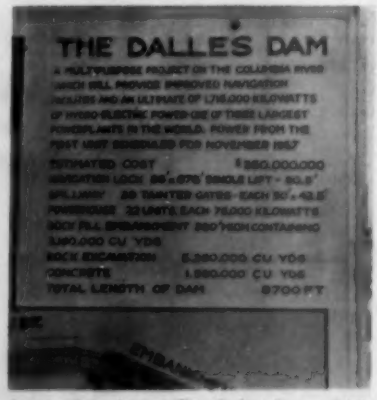
Panoramic view of The Dalles Dam on the Columbia River. Aggregate plant of Atkinson-Ostrander Co., to the right

The DALLES DAM—
Two Aggregate Plants Supply the

THE DALLES DAM, now under construction on the Columbia river, is one of the largest single construction jobs in the nation. The Dalles project is being built under the direction of the Corps of Engineers, U. S. Army at an estimated cost of $350,000,000. By comparison Hoover dam (Boulder), the highest concrete dam in the world, has to date cost less than half this figure. Nearly, 1,590,000 cu. yd. of concrete are involved.

The dam is being built about three miles up-stream from the town of The Dalles or about 51 miles above the Bonneville dam and 88 miles from Portland. Up-stream some 97 miles is McNary dam. The proposed John Day dam will be up-stream 25 miles. The additional electrical power gained by the Northwest due to the new dam will be 1,122,000 kw. of installed capacity.

One of the scenic and fascinating spots on the Columbia river are the Celilo Falls, where the waters of the mighty Columbia in a long series of cascades have presented a scenic spectacle unparalleled. For countless years, the native Indians of the region could be seen on their little platforms over the white waters of the rapids, spearing salmon. On the other hand, Celilo Falls has been an obstacle to cheap water transportation up the Columbia river. The reservoir formed by the Dalles dam will completely cover Celilo Falls.



Interesting sign at The Dalles Dam which gives some of the outstanding data about the project

There are two prime contractors doing the work. Each has a separate sand and gravel plant securing material from pits that are alongside of each other. From an aggregate production standpoint, the two plants present an interesting and completely different processing technique with emphasis on the sand recovery systems used.

The Permanente Cement Co. is delivering portland cement to the damsite in barges that haul up to 4000 bbl. per trip. The barges receive their loads

Finished material plant as seen from office. Note stone ladders

By WALTER B. LENHART

Materials for Big Power Project

from port-side silos near Portland. At the time of inspection about 18 barges per month were being delivered to the project.

The two main contractors are the Atkinson-Ostrander Co., which stems from the Guy F. Atkinson Co. and the Ostrander Construction Co., and the Dalles Power House Constructors. The latter company represents a group of nine contracting companies as follows: Donovan Construction Co., St. Paul, Minn.; Winston Bros. Co., Minneapolis, Minn; C. F. Lytle Co., Sioux City, Iowa; J. L. McLaughlin, a partnership, Great Falls, Mont.; S. Birch & Sons Construction Co., Great Falls, Mont.; F & S Contracting Co., Butte, Mont.; Foley Bros., Inc., St. Paul, Minn.; Johnson Drake & Piper, Inc., Minneapolis, Minn.; and Fegles Construction Co., Ltd., Minneapolis, Minn.

The Curtis Gravel Co., Spokane, Wash., operates the gravel plant supplying the Dalles Power House Constructors, and the Atkinson-Ostrander Co. has the second plant that supplies its own needs.

The Curtis Gravel Co. is a well-known sand and gravel company with several operations in the northwest. M. G. Curtis is president, L. W. Curtis, vice-president, and Glen C. Curtis, secretary. Jack Edwards is superintendent, and Bill DenBoer is project manager. The home office is at Spokane, Wash.

Deposits being worked by both companies are within a stone's throw of each other. The material is a typical river sand and gravel formation located about two miles down-stream from the construction site. Both deposits are deficient in fine sand as well as short some of the coarser sizes of sand. The Curtis Gravel Co. built a new plant alongside the pit. To get the proper sand gradation it blends two sand sizes. In one blend, the finer size is made in the pit, and the second coarser sand is added to the flow of material as it goes to the main screening tower by means of an inclined belt conveyor. The fine sand represents strippings from areas adjacent to the pit which are hauled to a point near the rim of the pit by one of three DW-20 Caterpillar earth movers where the material is dumped in windrows.

(Continued on page 54)

Overall view of Curtis Gravel Co. plant as seen from primary crusher. Belt to the right serves surge stockpile; scalper and secondary cone crusher may be seen in center, foreground

Flexible Plant Set-Up to Meet Specifications for Dalles Dam

• Atkinson-Ostrander Co., produces four sizes of gravel, and uses interesting fine sand recovery equipment. Rod mills supply additional fines to meet deficiency in certain sizes

OPERATIONS OF THE ATKINSON-OSTRANDER CO. at the Dalles Dam are quite different from those of Curtis Gravel Co. which also supplies aggregates for this important construction job. The first important difference is that the Atkinson-Ostrander Co. hauls the raw material to the damsite where the washing and screening plant is located. Pit conditions are similar to those at the Curtis Gravel Co., but the Atkinson-Ostrander Co. uses a Bucyrus-Erie shovel to load 30-cu. yd. capacity, bottom-dump, Peterbuilt trucks.

The trucks on arriving at the plant unload to a 60-cu. yd. capacity hopper over a 4- x 7-ft. Telsmith reciprocating feeder. The trucks straddle a 21-in. wide opening over the hopper to unload. The feeder serves an inclined belt that delivers to a 42-in. by 5-ft. vibrating Symons grizzly that has 5½-in. settings. Plus material falls to a 25- x 40-in. Cedarapids jaw crusher with throughs returned to the belt serving the vibrating grizzly. The minus fraction is moved by belt conveyor to a 5000-ton, live capacity, surge pile. This part of the plant might be called Section No. 1.

Washing and Screening Section

Section No. 2 involves the preparation of the four sizes of washed and screened gravel. These sizes are 3-in. to 6-in.; 1½-in. to 3-in.; 1½-in. to ¾-in.; and ¾-in. to No. 4. One interesting and important part of this plant is the use of four hopper-bottomed, rectangular steel bins of modest capacity as "holding" or surge bins. The purpose of these bins is to hold a reserve of the proper size of material. When the bin becomes nearly full, the plant operator sends the material to its proper ground storage pile by belt conveyor. The distance between these bins and the main ground storage pile is several hundred feet, and one belt conveyor delivers all four products to the shuttle belt over the ground storage pile. One size is moved at a time. The plant operator has complete control of this operation, operating the air ram gates and spotting the shuttle in its proper position over the ground storage piles.

Another function of the holding bins is to be able to divert any of the four sizes to the secondary crushing plant. The secondary crushing plant consists of a 4-ft. standard Symons cone, a 4-ft. short head Symons cone and two 3-ft. SH Symons cones. Six-inch or 3-in. minus material is fed to the 4-ft. standard to be reduced to sizes suitable for feed for the 3-ft. cones. Either 3-in. minus or 1½-in. minus may be fed to the 4-ft. short head. Either 1½-in. minus may be fed direct or oversize returns may be fed

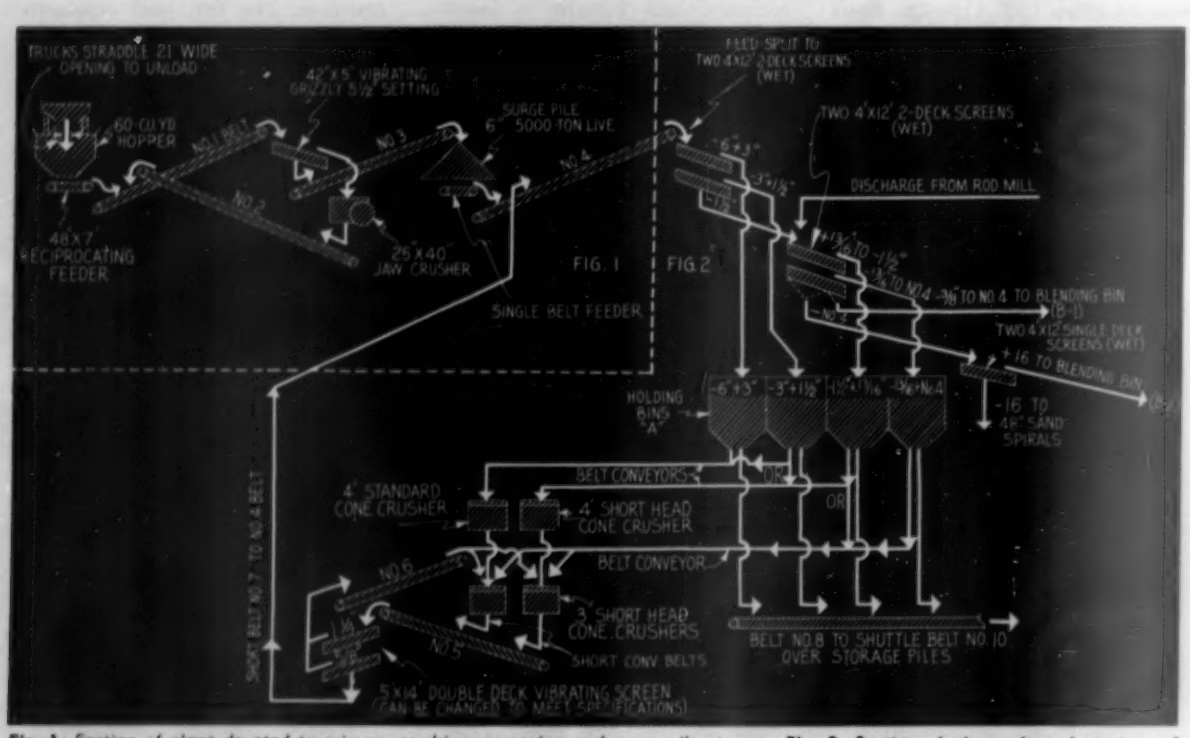
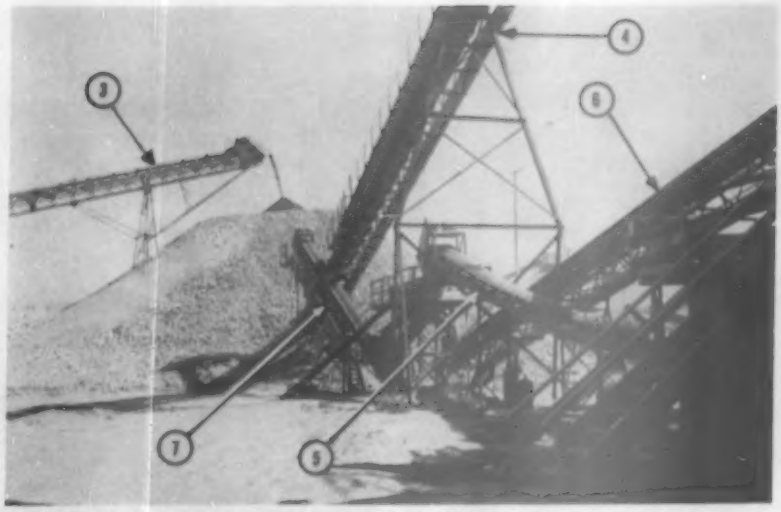


Fig. 1: Section of plant devoted to primary crushing, screening and surge pile storage. **Fig. 2:** Section of plant where four sizes of washed and screened gravel are produced. The plant has four cone crushers for secondary crushing

to the 3-ft. short heads. They are set at right angles to the No. 5 (crusher return) conveyor and are fed by a belt conveyor feeder running between the bins northward. A short return conveyor drops the product back on the No. 5 conveyor. The two larger sizes of finished gravel in the holding bins can go to a 4-ft. standard Symons cone. The two finer sizes of finished gravel can be diverted by separate belt conveyors to one of two 3-ft. Symons cones. The smaller cones receive a split feed from the belt serving them. All crushed material is conveyed to a 5- x 14-ft. Allis-Chalmers Ripl-flow, double-deck screen that nominally has 1¼-in. wire on the upper deck and ⅝-in. wire on the lower. Plus material on this screen is returned to the two 3-ft. cones by belt conveyor. Throughs move over a short belt conveyor to Belt No. 4 which is the reclaiming belt conveyor under the surge pile. The wire mesh on the Allis-Chalmers screen is changed as needed to meet specifications. The reclaiming belt conveyor under the surge pile is fed by a single belt feeder. A 10 hp. Reeves multi-speed gear motor is used to regulate delivered tonnages.

Belt No. 4 delivers material from the surge pile to two 4- x 12-ft. double-deck Symons screens (operated wet) that receive a split feed. These two screens prepare the two larger sizes of gravel which fall to the holding bins. Throughs from the lower deck flow to two 4- x 12-ft. Symons two-deck screens. The upper decks, equipped with $\frac{1}{16}$-in. wire, pass the 1½-in. minus material to the holding bins. The lower decks have 10 ft. of 4-mesh wire with a 2-ft. end piece of ⅜-in. wire. The relatively small amount of No. 4 to ⅜-in. pea gravel goes to one of three blending bins that are essentially a part of the sand production set-up. The minus No. 4 flows to two 4- x 12-ft. Symons single-deck screens that are equipped with $\frac{5}{32}$-mesh wire. The plus $\frac{5}{32}$-mesh, minus No. 4 goes to one of two small blending bins that are alongside the bin holding the No. 4 to ⅜-in. pea gravel. These three bins are an essential part of the sand blending system.



Surge pile in background receives minus 6-in. feed from scalper section. Numerals indicate location and function of belt conveyors in the flowsheet

Sand Preparation

By reference to Fig. 3 it will be noted that the minus 16-mesh products from the single-deck Symons screens split to two 48-in. by 23-ft. type S-H Wemco sand preparation machines. The fines from these two spirals flow to a 32-ft. dia. Wemco hydroseparator which recovers the finer sands as an underflow and, by means of a 4-in. Wemco pump, are delivered to a twin 66-in. spiral Wemco Duplex sand preparation machine. These two

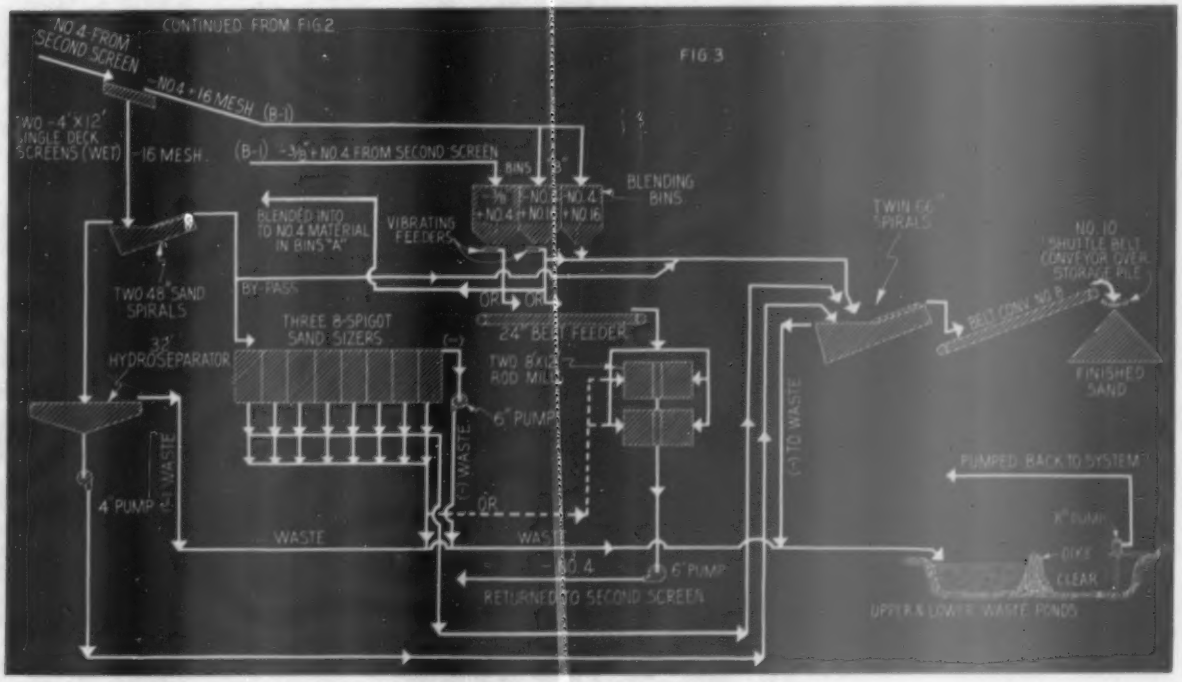
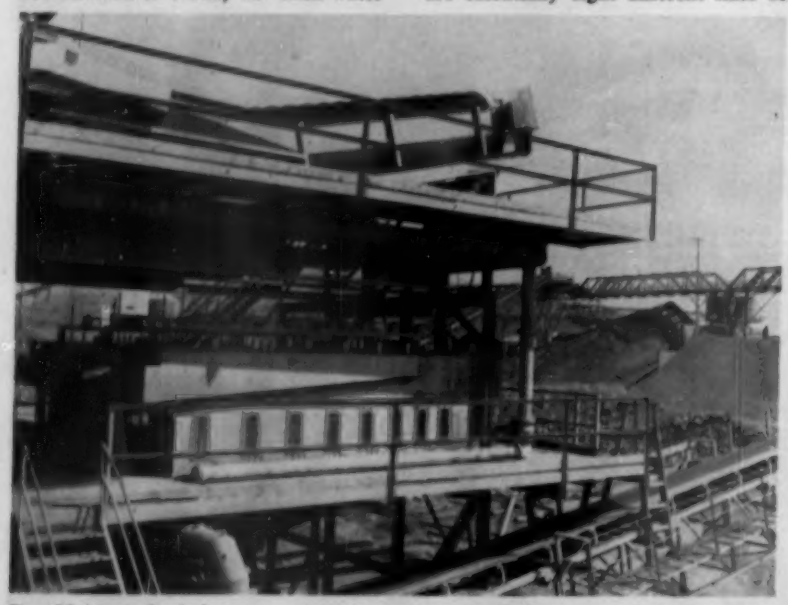


Fig. 3: Sand preparation section of plant showing how fine sands are recovered and rod mills are used to increase production of fines

Shovel loading a 30-cu. yd. capacity haulage unit. Material is transported about two miles to screening, crushing, and washing plant near dam site. Trucks dump to a 60 cu. yd. hopper over a reciprocating feeder supplying jaw crusher

larger spirals produce the final concrete sand, and in addition to the fines from the 32-ft. hydroseparator can receive fine material from several other sources.

The two previously mentioned 48-in. Wemco sand spirals are essentially designed to scalp off a large part of the excess water going to them. They are referred to locally as "sand-water stabilizers." The sand from these two spirals can all go direct or in part to the 66-in. spirals that prepare the final sand, or can be split to three, 8-spigot Dorrco sand sizers. The receiving compartment of the sizer has the smaller area and as the pulp flows through the device the compartments become larger in cross-section. Thus there are essentially eight different sizes of sand produced by each of the three Dorrcos. The outlet or spigot mechanism is controlled by a foolproof device developed by Honeywell. At the Atkinson-Ostrander plant each Dorrco sand sizer has a split (or two-compartmented) launder under the spigot section. Attached to each spigot is a short length of hose. By shifting the end of the hose from one part of the split launder to the other, sand can be either wasted, or sent to the 66-in. final sand preparation spirals. If desired waste sand can be sent to the Marcy rod mills.



Two 48-in. sand spirals act as water-sand stabilizers with the coarser sand going to the twin 66-in. sand preparation machine for final processing and the minus material from the 48-in. spirals going to the three sand sizers below

Woven into this circuit are two 8- x 12-ft. peripheral discharge Marcy rod mills which supply sizes of sand missing in the pit. The two rod mills get their feed from two of the previously mentioned three blending bins and/or waste sand from the Dorrco sand sizer. Rod mills are supplied by Jeffrey vibrating feeders under the No. 4 to ⅜-in. and under one of the 16-mesh to No. 4 size bins. No. 4 to 16-mesh sand in the two blending bins can be sent to the 66-in. sand spirals for final processing. Overflow from the 66-in. units goes to a settling pond that is divided into two areas by a dike. The dike acts as a filter. Liquid that goes through the dike is pumped back into the system by an 8-in. Fairbanks, Morse pump. The upper pond is a few feet higher in elevation than the lower so that the difference in "head" between the two ponds aids

View of plant from a point near finished storage piles. Belt conveyor, to the left, delivers four sizes of gravel, one at a time, to storage piles. Sand goes to one of three piles by a separate belt conveyor. Hydroseparator may be seen to the right; rod mills to the left

the percolation rate. Sand from the two 66-in. sand spirals moves by belt conveyor to a shuttle belt that builds three piles of finished sand so that adequate drainage is obtained.

Manufactured Sand

Each of the two Marcy rod mills, driven by a 350-hp. motor, grinds at the rate of 60 t.p.h., all to minus No. 4. The mills are fed at each end with discharge through ports in the center line of the shell. Discharge product from the mills is pumped back to the top decks of the second set of screens. The mills consume one pound of rods per ton ground. One mill is lined with Electric Steel Foundry manganese steel liners and the other with Lorain steel liners. A 6-in. Wemco sand pump with a capacity of 1000 g.p.m. at 55-ft. head delivers the Marcy discharge product to the screens.

A typical screen analysis of the Marcy rod mill discharge is as follows:

Plus 4 mesh	0.00
8 mesh	10.0
16 mesh	22.0
30 mesh	18.0
50 mesh	14.0
100 mesh	10.0
Pan	26.0
	100.0

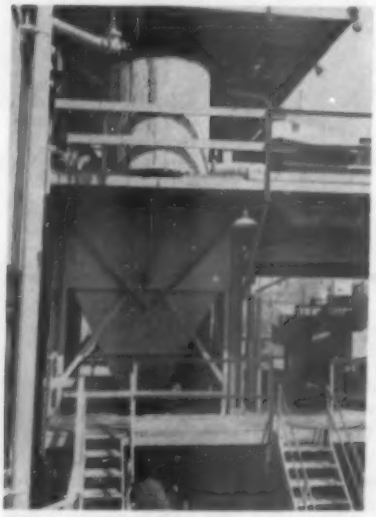
Pit-run sand has the following typical screen analysis:

Plus 4 mesh	0.00
8 mesh	1.00
16 mesh	3.00
30 mesh	10.0
50 mesh	39.0
100 mesh	25.0
Pan	22.0
	100.0

The short-head crushers produce about 10 t.p.h. of sand of the following screen analysis:

Plus 4 mesh	—
8 mesh	22.0
16 mesh	28.0
30 mesh	20.0
50 mesh	11.0
100 mesh	8.0
Pan	11.0
	100.0

(Continued on page 52)



End view of three-compartment surge bin holding ⅜ in. to No. 4, and minus No. 4 to No. 8 mesh in two of the compartments

Twin 66-in. by 29-ft. sand preparation machines. The two spirals in one tank prepare the finished concrete sand

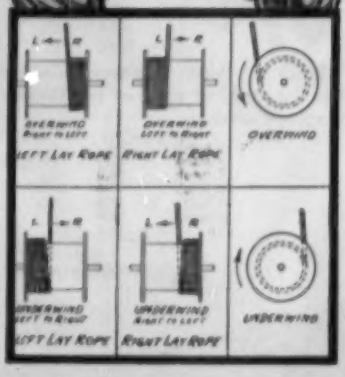
Tuffy® tips on the "lays" and

Partially Worn Regular Lay

Regular Lay ropes are used to a greater extent than Lang Lay, because Regular Lay wire ropes stand up better under the hazards of installation and use. Regular lay ropes are less susceptible to drum crushing and are not so readily damaged on sheaves of small tread diameter.

Partially Worn Lang Lay

Lang Lay ropes are about 15% more flexible than Regular Lay, and have a wearing surface *per wire* about three times as great. However, they crush out of shape more easily on small drums and are more easily damaged by sheaves with small tread diameter.



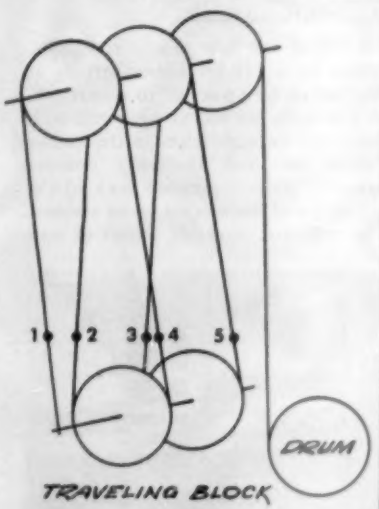
Rope Lay for One Layer Winding

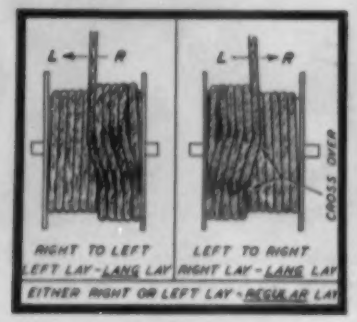
These diagrams show when it is best to use right lay or left lay rope on one-layer winding. The direction of winding is determined by standing behind the drum, looking toward the direction of the rope travel.

How To Count The Number of Parts Supporting the Load

The wire rope on many machines is not used in a single part or direct pull. It is often reeved through sheaves, which multiplies the power applied to the load. Drawing an imaginary line across the reeved rope parts, above or below the "crossing", and counting across gives you the number of parts supporting the load. Always include the rope end to the block, but not the part leading to the drum.

Send For Free Chart Which Allows Easy Figuring of Actual Stress On Rope For Any Given Piece of Machinery Reeving From One to Eight Parts.



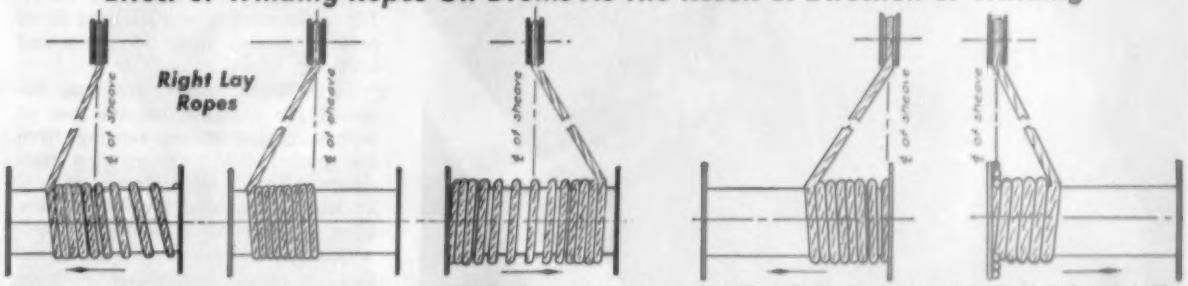


Rope for Two Or More Layer Winding

When a rope winds on the first layer across the face of a drum, it usually travels in a uniform pattern. But when it reaches the flange of the drum, the rope rides on the last strand of the first layer for one turn. Then, it slips into the grooves between each course of rope on the first layer. To move across the drum in this manner, the rope actually winds *back* a turn in each revolution. Then it must jump across *two* grooves in the first layer. This always occurs on the even-numbered layers, and often causes crushing. This abuse is minimized by use of properly designed grooves, spacers and lifters.

reeving of *Wire Rope*

Effect of Winding Ropes On Drums As The Result of Direction of Winding



Right to Left Overwind. Rope winds open to centerline of the drum, then it winds close.

Overwind. Allowed to run freely, the rope winds close to the left from center of drum.

Left To Right. Rope winds close the first four turns, open to center of drum, then close.

Right To Left Overwind. First two turns about 3/16" open, the balance close. Does not build up on flange.

Left To Right Overwind. The rope will build up three to four turns on flange before crumbling, then wind close.

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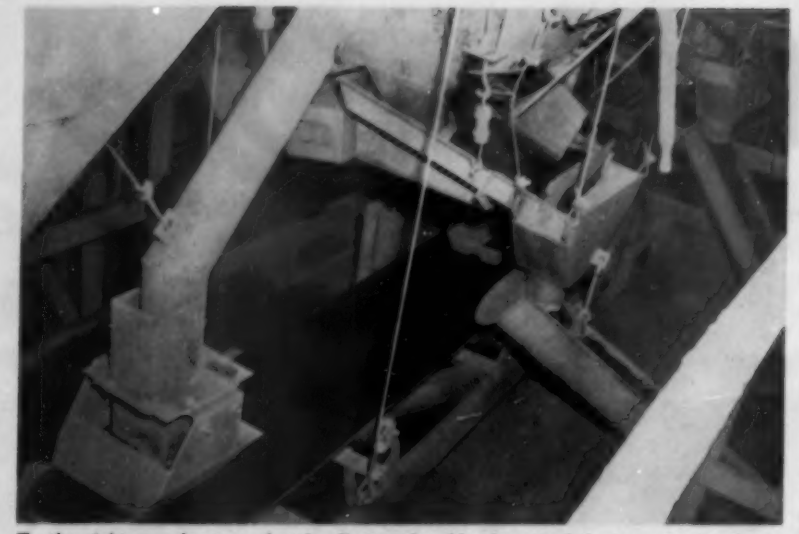

To the right may be seen electric vibrator that blends one of the sizes in the three-compartment bin to the twin 66-in. dewaterer

The average of several screen tests of the finished sand was as follows:

	Percent retained	Cumulative	Specs. tolerances
4 mesh	2.8	2.8	0-5
8 mesh	12.9	15.7	10-20
16 mesh	16.0	31.7	24-45
30 mesh	15.9	47.6	40-70
50 mesh	25.0	72.6	70-88
100 mesh	18.7	91.3	70-96.5
Pan	8.7	100.0	

F.M. 2.62
F.M. Specs; 2.40 to 2.90

Finished aggregates, including the three sand piles, are stacked in a single row with a reclaiming belt and tunnel below the piles. There are 21 Noble gates under the piles which are distributed as follows:

2 under the ¾-in.
2 under the 1½-in.
3 under the 3-in.
5 under the 6-in.
9 under the Sand

All sizes except the sand and the No. 4 to ¾-in. are re-screened over a 4- x 12-ft. Cedarapids vibrating rinsing screen from which the aggregates are moved by belt conveyor to the concrete batching plant. The two finer sizes by-pass over the screen.

Contractor personnel includes: John Morton, project manager for Atkinson-Ostrander Co.; Guy H. Heimsoth, assistant manager; Vern Bradley, general superintendent; Joe McNabb, excavation superintendent; Bill Rushing, aggregate plant superintendent; Andy Duray, aggregate plant foreman; and Ed Swanson, concrete superintendent.

H. B. Elder is resident engineer for the U. S. Corps of Engineers and Ivan Bechtold, concrete technologist for the Corps of Engineers.

Two of the cone crushers in the final reduction section

Bituminous Aggregate Conference

THE SECOND ANNUAL CONFERENCE on Use of Sand and Gravel in Bituminous Mixtures, sponsored by the National Sand and Gravel Association and the University of Maryland, was held at the University of Maryland, College Park, Md., on March 22-24, 1955. The meeting was attended by 66 persons coming from 23 states and Cuba.

T. E. Hittle, Asphalt Institute, discussed the classification and use of asphalt paving mixes, ranging from fine graded sheet to penetration macadams. Harry M. Rex, Bureau of Public Roads, discussed the broad problem of correlating laboratory tests with field performance; he pointed out that increasing dependence is being placed on performance tests, although no standardized tests have been developed. Paul F. Critz, also of the Bureau of Public Roads, considered additives for improving water resistance of bituminous mixtures.

Stanton Walker, N.S.G.A. director of engineering and chairman of the conference, talked on aggregate specifications for bituminous mixtures; he presented a comprehensive list of references covering specifications.

The Western Association of State Highway Officials test road was described by W. N. Carey, Jr., Highway Research Board, National Research Council. In this project gravel containing about 50 percent crushed particles, and sand, were used exclusively, with great success. Performance of bituminous surfaces made with gravel and crushed granite in North Carolina was discussed by A. Duke Morgan, North Carolina Highway and Public Works Commission.

John W. Griffith, Asphalt Institute, considered design criteria for asphaltic mixtures, with particular reference to composition, asphalt content, and strength. Procedures for arriving at optimum proportions of aggregate, filler and asphalt content were outlined. Relative merits of various strength tests were also discussed. George H. Dent, also of the Asphalt Institute, presented a paper on basic principles of construction of different types of bituminous surfaces.

Florida Ilmenite Plant Added

HUMPHREYS GOLD CORP. recently placed a second ilmenite processing plant into operation in Bradford County, Florida, about three miles northeast of Lawtey. The plant will produce about 72,000 tons of ilmenite ore annually from the lake sand deposit. All of the output will be purchased by E. I. du Pont de Nemours Co.

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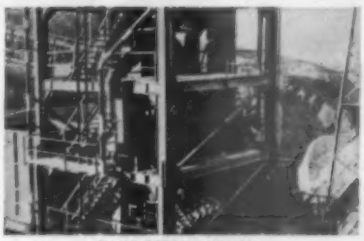

MAIN SCREEN HOUSE SHOWING SAND SIZER AND NO. 38 KENNEDY SECONDARY CRUSHERS AT SARIYAR DAM, TURKEY

STONE STORAGE—CONVEYORS NO. 3, 4, 5, 6, and 7 WITH TWO 5' x 12' DOUBLE AND TRIPLE DECK "AAA" KENNEDY SIZING SCREENS AT SARIYAR DAM, TURKEY

Here's a typical example . . . complete cement manufacturing equipment for SARIYAR DAM, TURKEY. *Another* KVS installation, operating at peak capacity in producing the cement required to build this enormous dam.

Whether the work to be done is in Turkey or Timbuktu, Alaska or South Africa, KVS engineers have designed and installed the *right* equipment. Right in performance . . . right in construction . . . right in quality.

KVS machinery and equipment is in use throughout the world and has established a reputation for economical operation, maximum output and low maintenance cost that has no equal!

KVS engineers are available for consultation anywhere in the world. Let us help you solve your cement, lime and crushing problems. Send for bulletins describing KVS machinery and equipment.

48" x 16" KENNEDY STEAM SHOVEL ROCK FEEDER WITH NO. 30 PRIMARY GYRATORY CRUSHER AT SARIYAR DAM, TURKEY

MAIN SCREEN HOUSE AND NO. 38 KENNEDY SECONDARY CRUSHERS AT SARIYAR DAM, TURKEY

IT COSTS LESS TO OWN THE BEST!

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Bottom-dump haulage unit unloading to primary jaw crusher

A 1½-cu. yd. shovel loading bottom-dump haulage unit

Curtis Gravel Co. - Dallas Dam Plant

(Continued from page 45)

A D-8 Caterpillar then pushes the fine sand over the rim of the pit as needed so the shovel can add it to the current production. There are two Caterpillar tractors available for this work. One has a "U" shaped blade that is used for the longer hauls.

The coarser sand is hauled from Lyle, a distance of about 10 miles. The material is dumped to a hopper serving a stacker belt which ground stores the sand over a reclaiming tunnel. A belt conveyor operating in this tunnel blends continuously to belt No. 3 serving the main screening and washing section. The finished washed sand and gravel from the plant of the Curtis Gravel Co. is then hauled in trucks to the storage piles ahead of the batching plant at the construction site. The present contract calls for delivering 850,000 cu. yd. of material.

By contrast, the Atkinson-Ostrander Co. hauls the raw material from its pit alongside the Curtis Gravel Co. pit to a washing and screening plant located near the damsite. At this plant rod mills, Wemco sand preparation machines and Dorrco sand sizers fill in the gradation gaps to meet the Army engineers' specifications. Both companies use the same graveled road and dust is kept at a minimum by adequate sprinkler trucks. The graveled road crosses an important state highway at right angles and an automatic stop-and go light signal has been installed at the intersection. Trucks approaching the intersection stop traffic on the highway by means of a red light operated through an electric eye. After the truck has passed the intersection at a pre-set time interval, the red light automatically turns green. The system permits loaded and empty returning trucks to highball through the intersection without delays, and at the same time, affords good protection for cars on the state highway.

Crushing and Screening Plant

Loading in the pit is by a 1½-cu. yd. Manitowoc shovel. Two DW-15 17 cu. yd. Caterpillar bottom dumpers haul the material to the hopper over the primary crushing section. A reciprocating plate feeder delivers to the primary crusher. The haul is only a few hundred feet over easy grades.

The main crushing elements in the plant of the Curtis Gravel Co. are a 25- x 40-in. Universal jaw crusher, a 4¼-ft. Symons cone following the scalping operation, and a 3-ft. cone of the same make for final reductions. Sand is recovered by two twin, 24-in. by 25-ft. Eagle sand screws that operate at 16 r.p.m. These receive a split feed from screens above.

A surge pile follows the primary crushing operation and material is reclaimed from the pile by a belt conveyor operating in a tunnel. The belt conveyor delivers to a 4- x 12-ft. Simplicity three-deck scalper screen, operated wet, with oversize falling to the 4¼-ft. Symons cone. Material from the scalper section is then transported to the main screening and washing section by a long inclined belt conveyor. To material on this belt is added the coarse sand fraction, previously described.

The plant, designed and built by the Curtis Gravel Co., uses belt conveyors throughout. There are four stacker belt conveyors for the gravel

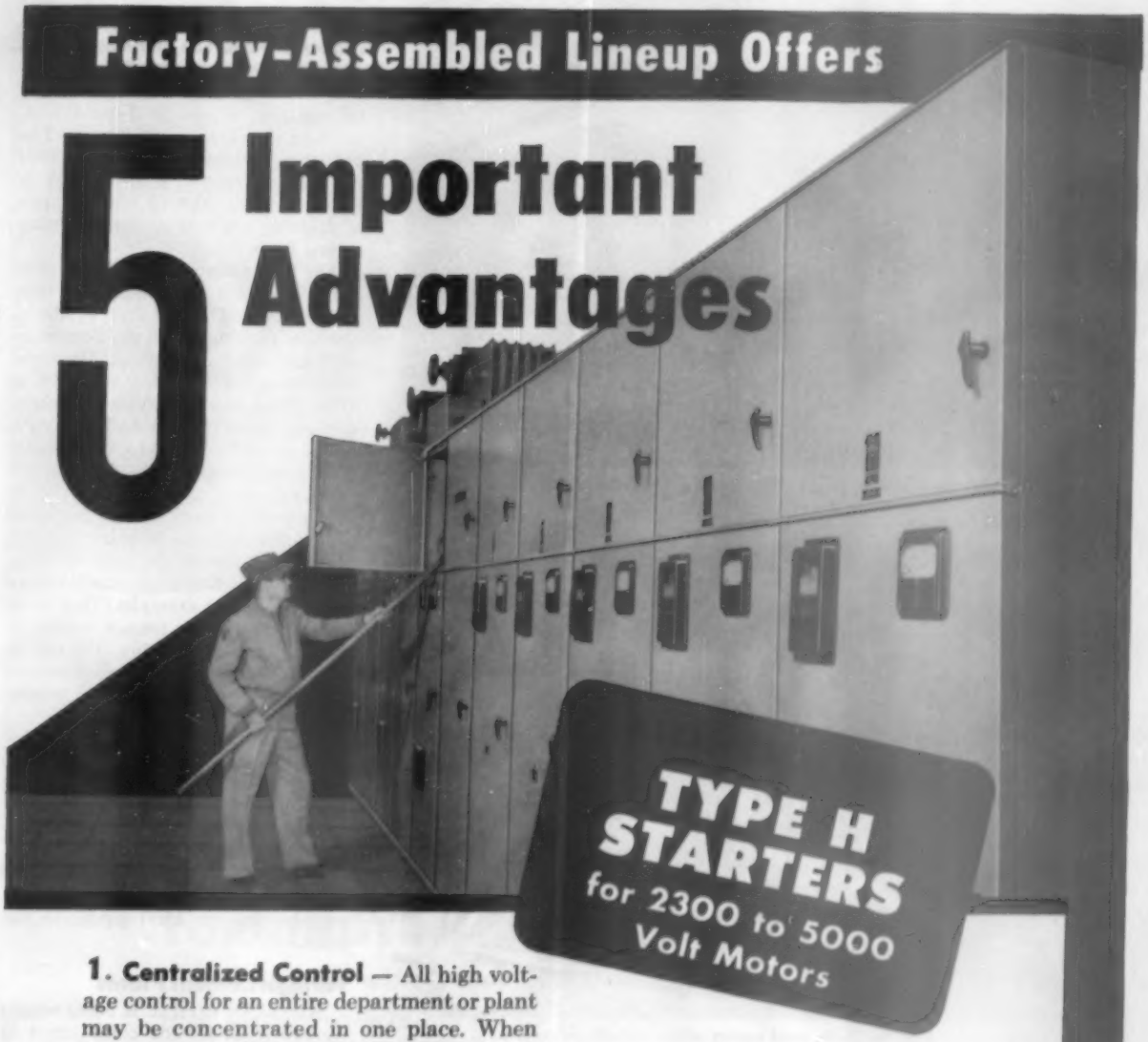
(Continued on page 56)

Loading sand into large capacity tractor-trailer unit

One of three scraper-haulage units to transport sand

Factory-Assembled Lineup Offers

5 Important Advantages



1. Centralized Control — All high voltage control for an entire department or plant may be concentrated in one place. When located in a separate control room, starter lineup operates in cleaner atmospheres. It also may be made inaccessible to unauthorized personnel.

2. Low-Cost Installation — Control group is factory-assembled *and bussed*. Conduit layout is greatly simplified. For example, lineup requires only one incoming power feeder.

3. Simplified Expansion — Internal bus and convenient wiring provision plus standardization of cubicle size facilitate addition of starters. Each starter unit is self-contained. Expanding the lineup is merely a matter of adding a starter and connecting the bus.

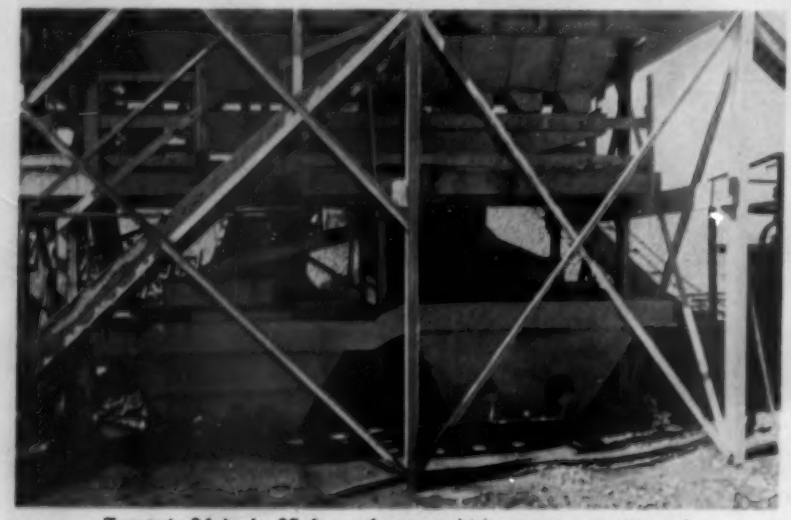
4. Attractive Appearance — Uniformity of cubicles presents a modern, streamlined appearance.

5. One-Company Responsibility Complete responsibility for assembling proper control devices and for control performance rests with Allis-Chalmers. A-4704

For complete information, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Scalping screen and cone crusher, left, following surge pile from primary crusher; coarse sand fed to plant from stockpile, right



Two twin 24-in. by 25-ft. sand screws which prepare concrete sand

Barges haul cement on Columbia River to the dam site where pumps deliver it to the batching plants

sizes with stone ladders used for the two larger sizes. The four sizes are the conventional sizes specified by the Corps of Engineers; 3-in. to 6-in. for the top size; 1½-in. to 3-in.; 1½-in. to ¾-in.; and ¾-in to No. 4. The plant has a capacity of 2000 to 2400 cu. yd. per day. Finished sand is stacked in two piles so that one pile is draining while the other is being drawn from.

The final wet screening section consists of two 4- x 12-ft. Simplicity two-deck screens. The top deck produces the 3-in. to 6-in. gravel, the intermediate decks, the 3-in. to 1½-in. Throughs from the lower deck flow to two 5- x 10-ft. Allis-Chalmers two-deck screens, operated wet. The top deck takes off the ¾-in. to No. 4, and all remaining sand products split and flow to the two Eagle sand screws.

Many of the items used in the plant were made portable in nature by the company. Some of the truck loading bins and the two Eagle sand screws could be used as examples. They have had a steel yoke or tongue welded to one end of each assembly. The unit is so built that it can be loaded onto a two-wheeled trailer and the tongue fastened to a truck.

Belts serving the plant are 36-in. wide. The stockpiling belts are 24 in. They ride on Robins troughing rolls.

Haulage units transporting the finished materials to the damsite include Autocars and White trucks. Some of these haul a 28-cu. yd. payload. Water for washing is from a well. An 8-in. pipeline delivers 1500 g.p.m. to the plant.

Foreign Cement Plants

AMERICAN CAPITAL is being sought by two firms for the construction of cement plants in Brazil and Pakistan. Cia. Mineira de Cimento Portland S/A, Rio de Janeiro, is planning to build a plant in the State of Minas Gerais, Brazil, and will commence construction as soon as financing is made available. French equipment will be used.

The Pakistan plant will be built near Karachi by Pakistan Builders, Ltd., Karachi. It will have a capacity of 200,000 tons annually. Management participation up to 50 percent and profit-sharing rights are offered to the investor. Presently two new plants with capacities of 100,000 and 50,000 tons respectively are under construction in Pakistan.

New Quarry

WHITMAN CONSTRUCTION CO. opened a new limestone quarry this spring near Kenmoor, Mo., to furnish 50,000 tons of crushed stone for the county in 1955.

IN THE CRUSHED STONE INDUSTRY, TORRINGTON *Bearings are used in many applications including crushers, screens, shovels, cranes, pulverizers, grinding mills and rotary kilns.*

Photograph courtesy of Caterpillar Tractor Co.

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are designed with one-piece bronze retainer that keeps rollers correctly aligned and effectively lubricated

Here are other reasons why TORRINGTON RADIAL ROLLER BEARINGS can meet your load and speed requirements. Only the finest quality steels, heat treated according to the most modern methods, are used in manufacture.

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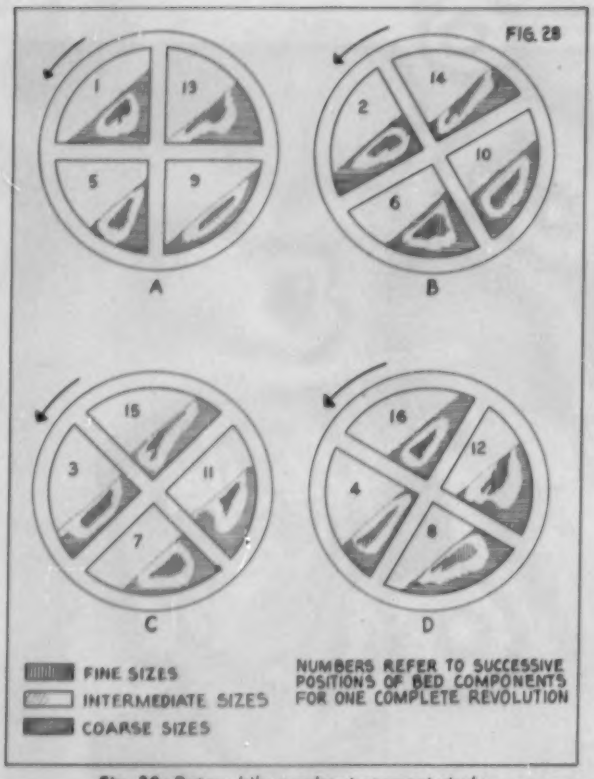


Fig. 28: Rotary kiln quadrant segment study

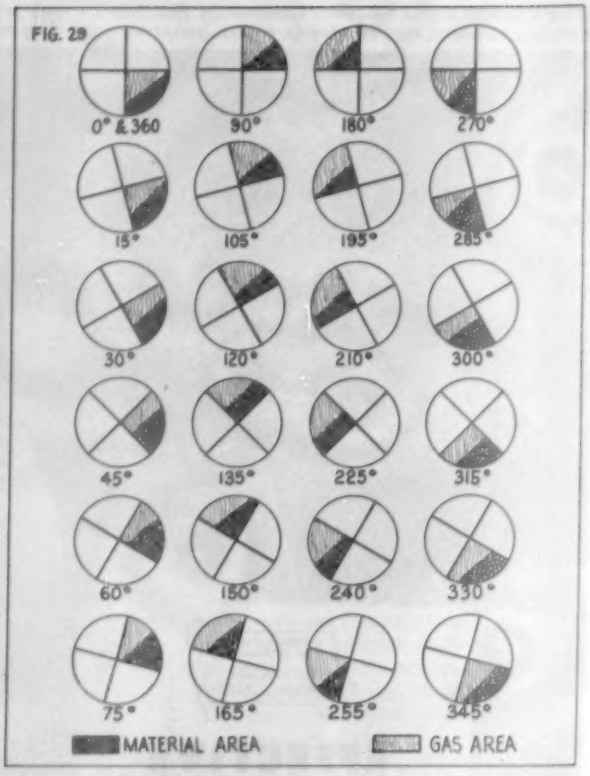


Fig. 29: Bed position in quadrant study

ROTARY KILN
Its Performance and Development

By VICTOR J. AZBE*

Part 5: Rotary kiln segmentation and its structure

IT IS PLAIN FROM A MERE GLANCE at Fig. 6 (ROCK PRODUCTS, February, 1955, p. 109) showing a rotary kiln in cross section, that while combustion space and gas flow area is very large, in its relation, the heat release surface of combined exposed lining surface and upper bed surface is very small.

Observing further, the heat absorbing surface of the bed, consisting of its upper flame exposed surface and its lining contacting surface, is also limited.

Furthermore, there is segregation of the bed component sizes, and the mixing is poor otherwise, particularly at the customarily low kiln rotation. For this reason there is a great temperature difference through the bed, which at certain internal locations is hardly high enough to complete calcination of the more calcination-resisting fractions.

This situation can be improved very greatly in a rotary lime kiln, divided into a plurality of sections somewhat as shown by Fig. 28, which offers a large number of heat transfer advantages. These advantages are:

1. A much greater surface is available for the release of heat by the gases, tending to a much more rapid and more complete absorption of heat generated by combustion.

2. Simultaneously, the surface available to stone and lime for the absorption of heat is also greatly increased.

3. Heat absorption surface available to lime and stone is increased in a greater degree than surface to the gases for dissipation of their heat; a distinct advantage. With faster absorption, there is a faster release and a lower required temperature difference to transfer a given amount of heat, resulting in lower kiln temperature.

4. Kiln load can be greatly increased, from two to four times, and as mixing and exposure is complete, heat is brought to individual particles, idle surfaces are made to work and kiln capacity increased, in spite of the lowering of kiln temperatures.

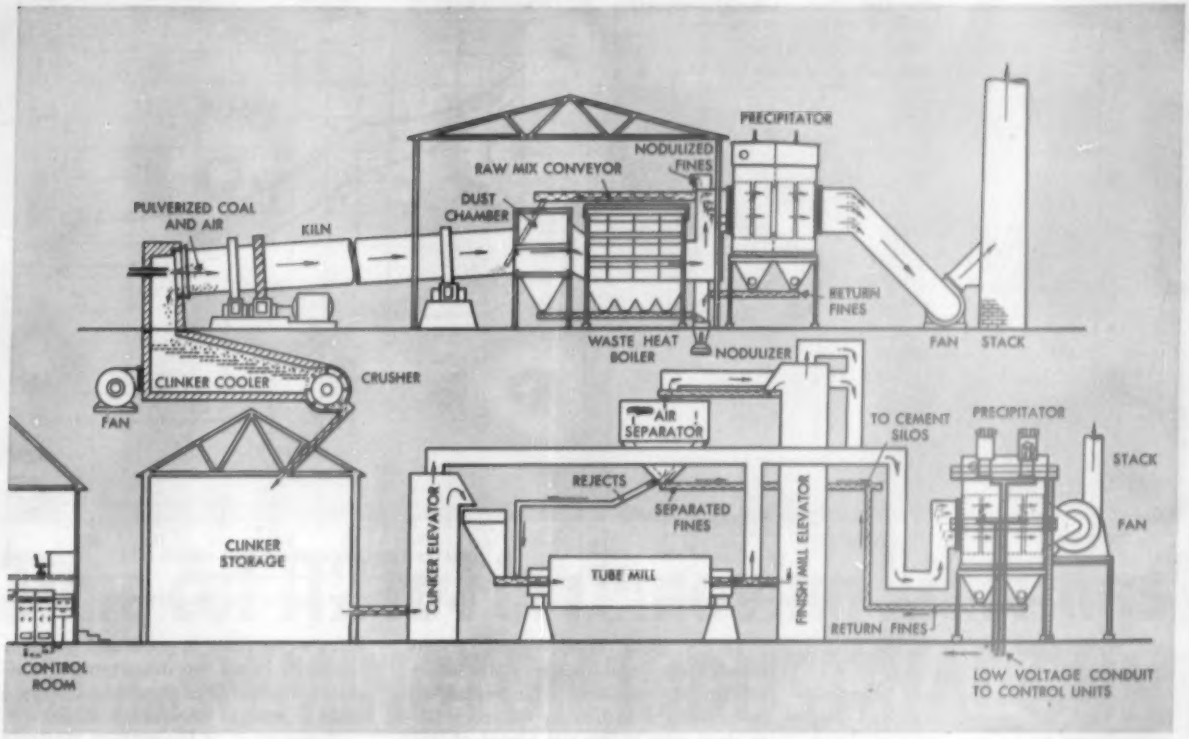
5. The structural members introduce into the kiln highly effective heat exchange surfaces, such as the open rotary kiln does not possess. For half of the kiln revolution the surface is absorbing heat from the gas stream; for the other half it is passing off heat to the bed, Fig. 29.

6. The system introduces heat transfer surfaces into the kiln differently than in open kilns, tending not to waste heat to the outside.

7. When the gases are passing to one side, heating the surface, the solids are usually passing to the other

(Continued on page 60)

*President, Azbe Corporation, St. Louis, Mo.



How dust collecting problems are handled in the modern cement plant

The "why" of the Cottrell precipitator is well known to cement plant personnel—its use in nuisance abatement and cement dust salvage is well established. These diagrams explain the "how" of the Cottrell, including its familiar application to kiln gas and, more recently, its use in the ventilating system of the finishing mill.

Kiln Gas

The upper half of the drawing shows a Cottrell for cleaning kiln gases. They are first passed through a dust chamber to the waste heat boiler and from there to the electrical precipitator, where the dust is removed. Salvaged dust is returned by conveyor to the process. The cleaned gas is discharged to the atmosphere through an induced draft fan and the stack. (Wet process kilns may also be fitted with Cottrells).

And In The Finish Mill

Dust from the grinding mills has always been a major problem. The lower half of the diagram shows the recent application of the Cottrell for cleaning finish mill ventilating system gases. Cement dust is collected from the ventilating system serving the separators, conveyors and elevators. As before, recovered dust is returned to the process.

Separating Small From Large Particles

When large particles of low alkali content must be separated from very small particles of high alkali content, an integrated mechanical-electrical precipitator will do the job effectively. The mechanical element handles large particles, and the electrical element collects the smaller particles that escape it.

Rapping Puffs Eliminated

With Research-Cottrell's electronically controlled Magnetic Impulse Rappers, there is no need for rapping shutdown periods or dampers. Automatically controlled and operated, the MI Rappers continuously rap the electrodes throughout precipitator operation, thus avoiding dust re-entrainment in the gas stream and assuring optimum precipitator performance at all times.

Many Design Advances

The MI Rapper is one example of many improvements that have taken place in the design of precipitators and their associated electrical equipment. Forty years of experience have provided Research-Cottrell with a rich store of engineering skill—it is this skill that has evolved the modern Cottrell precipitator, embodying a design based on knowledge gained through more than 2000 precipitators in many different fields. Fourteen of these have been installed or are under construction for cement plants. All of these precipitators were custom-engineered to individual specifications.

For a more complete description of the Cottrell precipitator, write to Research-Cottrell for Bulletin GB.

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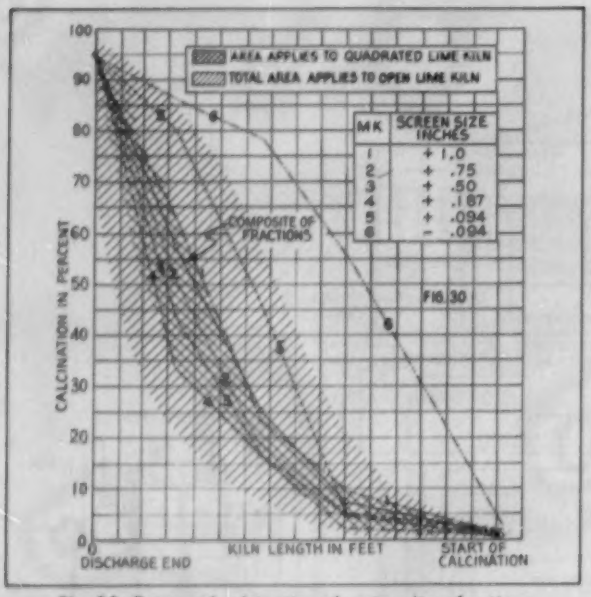


Fig. 30: Degree of calcination of various lime fractions

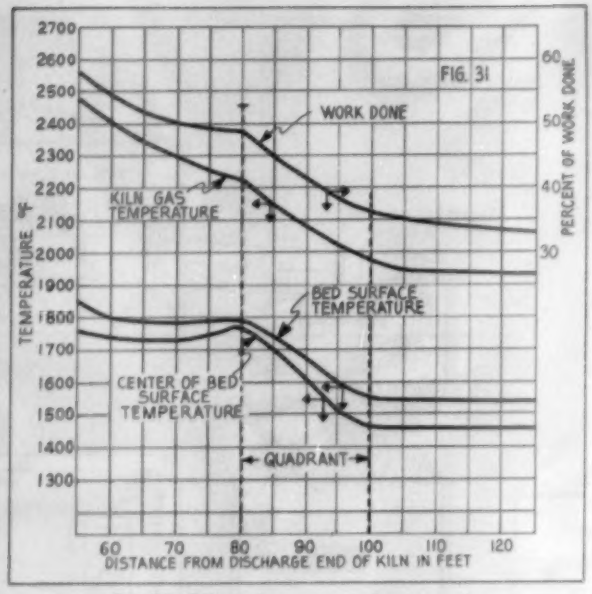


Fig. 31: Effect of segment on heat transfer

side, cooling the surface of the structural members.

8. Through segmentation, there is more intimate gas mixing, and less gaseous stratification, resulting in a quicker and also more complete combustion. Delayed combustion extending into the preheating zone cannot occur.

9. Radiation heat transfer is improved for any given conditions of temperature difference and luminosity, since four streams of smaller dimensions are in this respect more effective than one large stream.

10. Quadration brings the hottest gases, ordinarily tending to flow along the roof of the open kiln, closer to the surface of the lime. Through this and for the other reasons; such as, a higher surface velocity, heat transfer by convection is also increased.

11. A great improvement results through the breaking up of size segregations of stone and lime, repeat exposure of the ordinarily hidden smaller sizes, and in the attainment of uniform temperature throughout the bed.

12. In addition, there is a great reduction or complete elimination of the sliding tendency of the upper surface of the mass and assurance of the desirable rolling overflow.

13. Abrasion would be less as the rolling would be through a shorter distance and for a shorter kiln retention time.

14. Although stone sizing would still be desirable and would lead to a quality product of uniform characteristics when stone is good and uniform reactivity is not too important, a completely burned lime should be obtained from a straight line run of stone.

A summary of the surface available in square feet per running foot of an 8½-ft. internal diameter kiln for different stone loads is as follows:

	Open Kiln		Quadrated Kiln		
Load	18 in.	6 in.	9 in.	12 in.	15 in.
Material Exposure	14 ft. 7 in.	22 ft. 9 in.	33 ft. 9 in.	37 ft.	40 ft. 10 in.
Gas Exposure	22 ft.	49 ft. 2 in.	48 ft. 5 in.	46 ft. 8 in.	45 ft. 7 in.

The increase in surface is very great, particularly that of material to gaseous flow and to hot wall contact. In addition, of course, as previously outlined, the effectiveness of the surface is increased.

Samples of lime withdrawn from various points of operating kilns were screened to size and each group analysed separately. The range in degree of calcination of an open type of rotary kiln extended over the width of the total shading of Fig. 30, and only 30 ft. from the discharge end of this particular 300-ft. long kiln there were fractions which were only 23 percent calcined and others that were 85 percent calcined. The abraded material, which would be lime, is left out of consideration. The normal, smallest size was the least calcined and the largest, the most calcined, even more than it appeared since it lost the abraded portion.

It is this condition which carries $CaCO_3$ to the very outlet of the rotary lime kiln, and also carries it into the clinkering zone of cement and sintered dolomite kilns, greatly interfering with the reactions and consolidations therein.

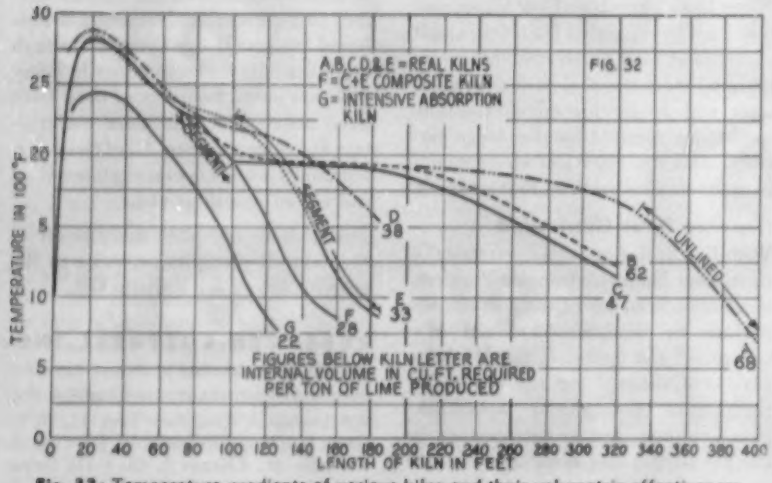
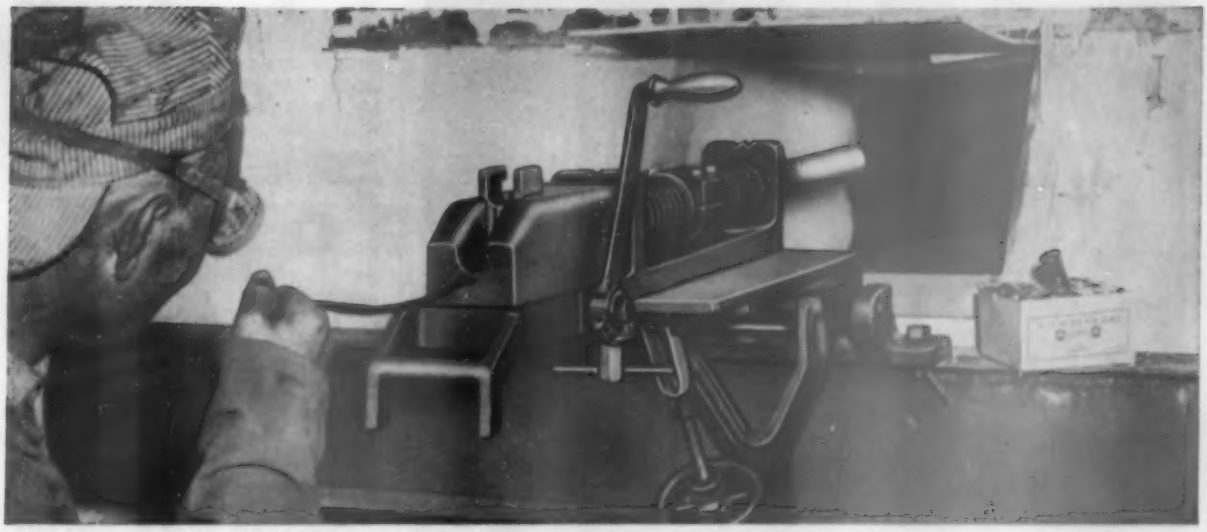

A,B,C,D,E = REAL KILNS
F = C+E COMPOSITE KILN
G = INTENSIVE ABSORPTION KILN
FIG. 32
SEGMENT
UNLINED
FIGURES BELOW KILN LETTER ARE INTERNAL VOLUME IN CU. FT. REQUIRED PER TON OF LIME PRODUCED
TEMPERATURE IN 100 °F
LENGTH OF KILN IN FEET

Fig. 32: Temperature gradients of various kilns and their volumetric effectiveness

(Continued on page 62)



Time cut 112 to 1 in removing kiln rings with the REMINGTON INDUSTRIAL GUN

VARIOUS MOUNTINGS ARE POSSIBLE with the Industrial Gun. Here's one of the most common: secure a 6" or 8" "I" beam across the face of the kiln and simply hook the mount into the bolster. The gun can also be mounted on a truck, a tripod, or a mobile chassis for shooting down obstructions in mines or quarries.

26 hours per month production time gained by refractory plant

"We save 222 man-hours per month—and gain 26 hours' production time!" That's how the superintendent of a large refractory plant in Georgia sums up the reasons he's sold on the Remington Industrial Gun. Formerly, removal of kiln rings took 8 men an average of 28 hours per month. Two men now do the same job *in one hour.*

Hundreds of plants have found the industrial gun to be the fastest, most efficient method for ring removal. In seconds, one man can aim, load and fire the gun. A few shots loosen the ring . . . cause it to crumble when the kiln is rotated. There's never any need to cool and reheat the kiln. *Downtime is cut to a minimum!*

Use of the Remington Industrial Gun can mean big savings in labor, big gains in production for you. Our technicians will be glad to work with you on ring-removal problems at your plant. Just send the coupon for a free illustrated folder with complete information.

"If It's Remington—It's Right!"

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REMINGTON INDUSTRIAL SHELLS have tremendous smashing power. They're loaded with a powerful 3-ounce lead projectile that develops 7,475 foot-pounds' muzzle energy.

CUTTING A "KEY-WAY." A few well-placed shots loosen a section of clinker. The ring is weakened by this loss of the arch key . . . will usually fall without additional shots when the kiln is rotated.

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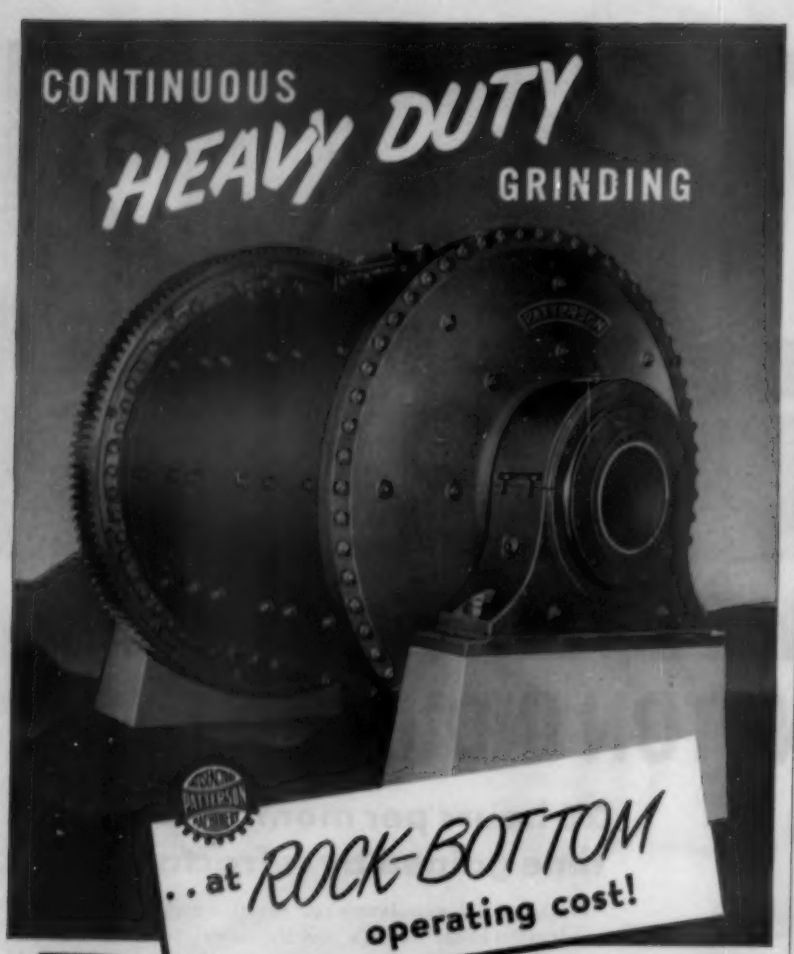

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The Patterson Foundry and Machine Company, (Canada) Limited
Toronto, Canada
MONTREAL

The previous trend was to segment the preheating zone; however, in the writer's opinion it should be the calcining zone and as far down as possible. The question offered was, "How would the segments stand the high temperatures?" However, if there are segments, the very high temperatures would not be present. Thus, a combination patent was applied for, of which one of the features was extension of segments as far as the combustible premix requirements would allow.

However, the theory was never properly proven until a progressive client offered to install a 20-ft. stretch of quadrants extending into the calcining zone. Twenty feet was not much but it condensed the wide shaded area of Fig. 30 into the narrow black band shown.

Quite a bit of testing was done, both before and after the installation of this strip of 20 ft., some of it rather acrobatic but worth it, as much valuable data was collected. While Fig. 30 shows the degree of calcination range, Fig. 31 shows the effect of the strip on the gas temperatures, the bed surface as well as inner temperature and also on the work done. It shows how much faster the gases cooled, how much faster the stone preheated, and how it drew the bed temperatures together. It also shows how much more work was accomplished within the segmented section as compared to that outside of it toward either end of the kiln.

Knowing these temperature gradients, the amount of lime made and fuel burned, it is simple to calculate the heat transfer rate, the required length of a more fully segmented kiln and the likely temperatures that will be encountered at either end of such a kiln.

Fig. 32 presents an interesting group of temperature gradients of several kilns of different length, operating under varying conditions and at different capacities. Thus "A" is a very long kiln operating at 68 cu. ft. internal volume per ton of lime. Its exhaust temperature is quite low because the rear portion of the kiln was unlined. We find no fault with having part of such a long kiln unlined, as it is just the thing to do. The gases can then pass directly to the exhaust fan, without bothering with water sprays, or cooling air admission provisions. What is interesting about this curve is the flat section, the long idle sections. What good does it do?

"B" and "C" represent the same 320-ft. kiln. It is a kiln which we tested thoroughly. It also has an idle section, but not so long. This section

(Continued on page 64)

Here's what we mean by LOW-COST MAINTENANCE

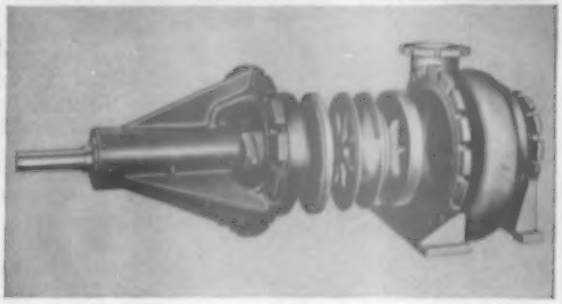
ALLIS-CHALMERS Solids Handling PUMPS

1 Troubles are few and far between

One user of Allis-Chalmers solids handling pumps said, "We've been operating them for 8 months without loss of capacity." . . . another said, "We ran it for 13 months before we replaced the first part."

2 Inspection is an easy routine

Take-down and re-assembly require less than half an hour. Merely disconnect the drive . . . loosen the nuts on casing bolts . . . and lift out the bolt assemblies. Then, swing out the rotating element. There's no need to disturb the suction or discharge piping.



3 Parts replacement is fast, economical

Wear is limited because there are only five wearing parts. Many parts are interchangeable among several sizes of Allis-Chalmers solids handling pumps so you won't have to carry big spare parts stocks. What's more, because parts replacement *is* infrequent . . . because it's so fast and simple . . . down-time production interruptions are held to a minimum.

In addition to sound design, Allis-Chalmers solids handling pumps feature special hard alloy *Ni-Hard* and extra thickness of metal in critical spots. Then, too, each A-C pump is application engineered to meet the specific conditions under which it will be used.

Remember, Allis-Chalmers can furnish the complete pumping unit—pump, motor, control and drive. Next time you need a solids handling pump, call your A-C representative or write—Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 52B6381.

A-4603

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

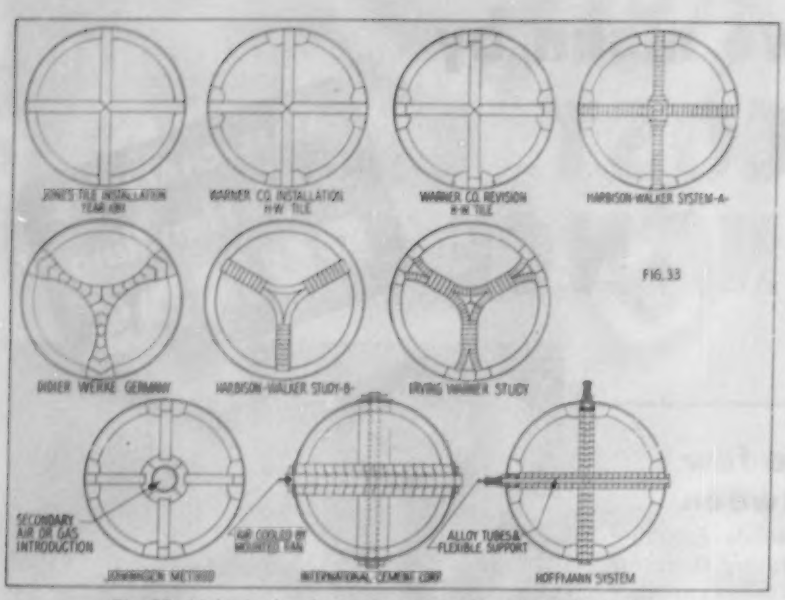


Fig. 33: Multiple chamber arrangements for rotary kiln sections

Segmented Rotary Kiln

(Continued from page 62)

was somewhat shorter when the kiln was operated at 47 cu. ft. than at 62 cu. ft. per ton of lime. When operating at the higher capacity, the kiln had the 20-ft. stretch of quadrants. The remarkable leveling off in temperature of the gases on leaving the quadrant section should be noted.

"D" and "E" curves are also of the same kiln, operating at a rather good capacity rate of 38 and 33 cu. ft. per ton. At these rates neither gradient curve shows a very pronounced flat middle section; there is only a flattening. The kiln was operated as an open kiln when test "D" was made, and it was heavily segmented when test "E" was run. In the latter, segments extended between the marks for a distance of 70 ft. The gases were cooled as low as they could have been cooled at the fuel ratio that the kiln was operating. One may say that the kiln had a fully effective preheater.

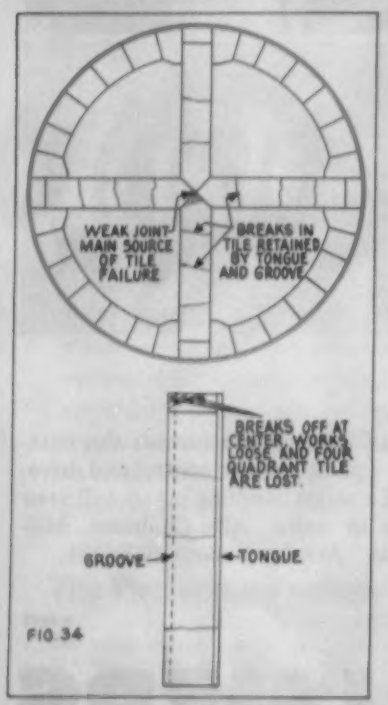

WEAK JOINT-MAIN SOURCE OF TILE FAILURE
BREAKS IN TILE RETAINED BY TONGUE AND GROOVE
BREAKS OFF AT CENTER, WORKS LOOSE AND FOUR QUADRANT TILE ARE LOST.
GROOVE
TONGUE
FIG. 34

Fig. 34: Usual points of quadrant tile deterioration

At the time, results of test "D" were record breaking, a capacity at 38 cu. ft. per ton without an exhaust fan. Those of "E" were also record breaking. By then an exhaust fan system had been installed, but capacity at 33 cu. ft. was still a record, and exhaust temperature, equal to the minimum possible for the lime fuel ratio without an external preheater, was also a record. A noble achievement but all of the pieces of the jigsaw puzzle did not quite fit and maximum results were still not obtained. However, it was a long step forward .

The curves of Fig. 32 make up such a useful map, which tells one where not to go. It offers a better way and even features the reason why it is better. These are not a few accidental curves from a few tests as many have been run. In line with what had been featured earlier, if "E" had more of the calcining zone segmented, and less of the preheating zone, results would have been better, and if certain other features had been satisfied, would be entirely satisfactory as far as performance is concerned.

In the case of kiln "C," the 320-ft. kiln, if the quadrants had been extended 20 ft. into the hot zone and 20 ft. toward the rear, 120 ft. of the kiln could have been eliminated, maybe more. What could have been done would be to operate this rear portion unlined as in the case of kiln "A," for a cooler exhaust, a higher fan capacity, stronger draft, and an increased kiln output, thus obtaining all the secondary benefits which come from high capacity operation.

It is quite evident that if we attached the lower part of the "E" curve to the "C" curve, we would get a kiln operating at a 28-cu. ft. rate, curve "F." But this is not right either. What is right is shown at "G." Segmentation would be from 40 to 100 ft., a kiln totalling only 125 ft. long, of low peak temperature and lower exhaust temperature than any of the others.

This would result in a minimum radiation loss and, if further amplified with a minimum of cooler loss, there would be a maximum of stone flow leading to a minimum of exhaust loss.

Segment Structure

However, if the inserts last but six months or even a year, the result is not satisfactory. Some have lasted two years and more, but mostly their life is much shorter.

If they were used in a manner conducive to obtaining the greatest benefit, then even imperfect as they are, one could still afford to keep them up. But when the gain is small, trouble is considerable, and the desire is more for "easy" than for "good" operation, their trials would soon be terminated, which would be unfortunate for the entire lime industry.

We think they could be made entirely practicable and long lasting if studies were coordinated toward this end. Instead, they are put in here and there but mostly in the same old unsatisfactory way.

(Continued on page 102)

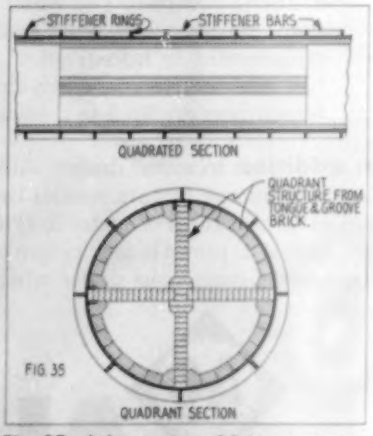
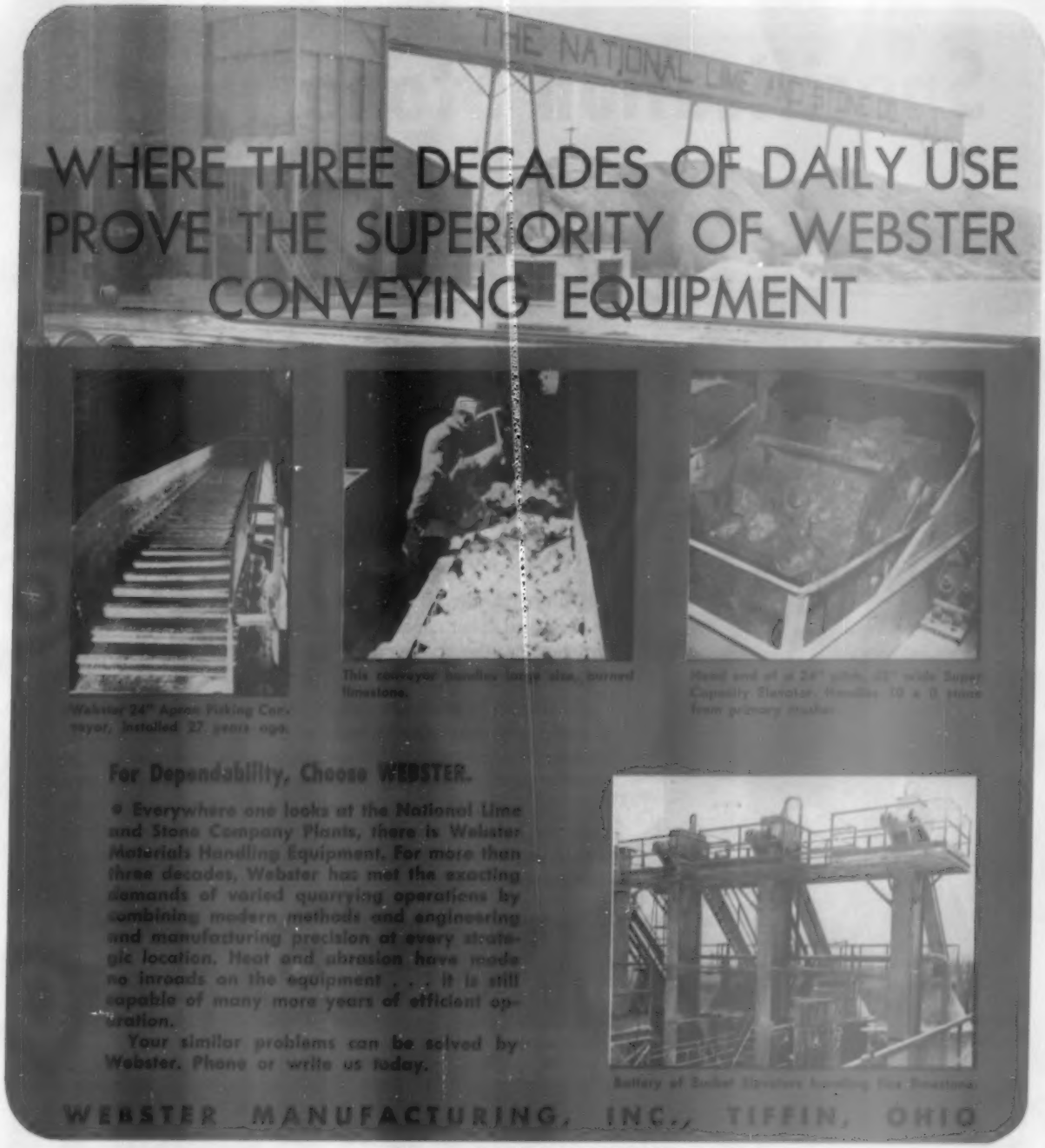


Fig. 35: Azbe version of kiln segmentation



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Specification Stone

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In this truly modern crusher, *Hydroset* control provides a rapid and convenient means of raising and lowering the hydraulically supported crushing mantle. Adjustment to precise product size can be accomplished by the flick of a switch. Compensation for wear can be done in the same manner. In addition, *Hydroset* control facilitates emptying crushing chamber in case of power failure or other emergency.

Hydrocone CRUSHERS

For complete information, see your local A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 07B7145B.

Produces a Cubical Product

The *Hydrocone* crusher also helps you meet specifications by producing a uniform, cubical product because of its small eccentric throw in relation to crusher setting. Fines, slivers and flats are kept to a minimum because of the smaller effective ratio of reduction during each crushing stroke. With a small eccentric throw, the open side setting is also smaller. This results in a smaller top size product.

Hydrocone and Hydroset are Allis-Chalmers trademarks. A-4653

ALLIS-CHALMERS

• National Industrial Sand Association celebrated its 20th anniversary at convention in Hot Springs, Va., May 10 to 13. Program included progress reports on dust control studies, legislation, percentage depletion, fineness and grading of foundry sands, and a review of Washington developments

Clarence R. Wolf, president, in center; with **Emery M. Durstine,** vice-president, to the left; and **Wm. J. Cannon,** treasurer, to the right

Industrial Sand Association Convention Honors Past Presidents

TO CELEBRATE ITS TWENTIETH ANNIVERSARY, the National Industrial Sand Association made the annual meeting "all-together dinner" a special occasion by honoring past presidents with awards of certificates of merit. Honored were: J. M. Strouss, Deckers Creek Sand Co.; A. Y. Gregory, Whitehead Brothers Co.; Geo. Thornton, Ottawa Silica Co.; Sterling Farmer, Sand Products Corp.; Clarence R. Wolf, New Jersey Silica Sand Co. (1955 president); and A. Warsaw, Wedron Silica Co. As a token of appreciation, executive secretary, V. P. Ahearn was presented with a high fidelity radio. Mr. Warsaw told about the interesting developments in the NRA days which led to the formation of the Association. A very good attendance at the convention held at The Homestead, Hot Springs, Va., May 10 to 13, was representative from all companies.

Reelect Officers

President Clarence R. Wolf, in his welcoming address on the first day of the convention, paid a tribute to the members in the early days of the association history who made possible many valuable contributions to the industry through their association activities. He also praised the efficient work of executive secretary Vince Ahearn and engineering director Stanton Walker and the committee members.

A. Y. Gregory presented the report of the nominating committee which recommended the following slate of officers for reelection: president, Clarence R. Wolf, president, New Jersey Silica Sand Co.; vice-president, Emery M. Durstine, secretary-treasurer, The Keener Sand & Clay Co.; and treasurer, Wm. J. Cannon, secretary-treasurer, The Nugent Sand Co. Members elected to the board of directors are: W. B. Chadwick, Manley Sand Co.; Arthur F. Harrison, The Ayers Mineral Co.; Arthur B. Schlesinger, New Jersey Pulverizing Co.; Al. Gawthrop, Wedron Silica Co.; Russell Cronenweth, Great Lakes Foundry Sand Co.; and Earl Andrews, Pennsylvania Glass Sand Corp.

Geo. Thronton, Ottawa Silica Co., proposed a change in the constitution to provide for a rotating board of directors, consisting of nine members and the three officers. This amendment will be presented to the members for action at the Fall meeting.

Percentage Depletion

John Sapienza, tax counsel for the association, outlined the present status of percentage depletion, covering new legislation, regulations, rulings and court decisions. He also reviewed the corporate income tax rates, the status of the double deduction clause with particular relation to vacation pay, and the repeal of section 462. He explained in detail provisions covering elective aggregate mineral interests, and the ruling on the definition of quartzite. He pointed out that the regulation covering leasing of plant and deposit provdes that the lessor is entitled to percentage depletion on the full amount. Mr. Sapienza also mentioned that in the matter of cash discounts, more than 6 percent might be disallowed and considered a trade discount.

The most important court decision, he said, involved the Georgia federal district court action in the Cherokee Brick & Tile, Inc. case, involving the cut-off point, which is of special interest to pulverizers. This decision held that the cut-off point for percentage depletion purposes extended beyond the raw clay to include molding and burning. It held that Congress intended that the processing should be extended to include the first marketable product. The company also won on an appeal to the claims court. Mr. Sapienza also referred to decisions in the Black Mountain Corp., covering oil-treated coal, and National Lead Co., on ilmenite. Considerable discussion revolved about the end-use interpretation applicable on 1951, 1952 and 1953 reports.

A. Y. Gregory, chairman of the Percentage Depletion Committee, asked

members to review their experiences involving percentage depletion rulings.

Arthur Schlesinger, chairman of the sub-committee on Silica Flour in Autoclaved Products, said that the presentation of their report had completed the committee's assignment, but he suggested that a new permanent committee be appointed to deal with ground sand problems.

Wm. Chadwick, chairman of the Committee on Fineness and Grading of Foundry Sands said that a report will be made available for distribution to all interested members. He said that the committee had been asked by the American Foundry Society to write a chapter for the society's new handbook. He asked for cooperation in complying with this request. Stanton Walker reported that the committee has been working very cooperatively. He also reported on the use of glass beads for testing efficiency of screens. Ed. Sawyer stressed the importance of A.S.T.M. C-21 report on Ceramics.

A considerable discussion, involving the impact of sand reclamation on the industry, was developed through a review of member experiences. It was suggested that members transmit to the committee headed by Wm. J. Cannon, the problems encountered by users of reclaimed sand.

Emery Durstine, presiding, called on Norman Crissey, Wedron Silica Co., to give his report on the recently negotiated Ottawa district labor contract. Following this report, there was a round-table discussion of labor conditions in other parts of the country.

Dust Control

Theo. Hatch, director of research, Industrial Hygiene Foundation, addressed the meeting on the latest developments on the silicosis problem and the recently completed phase of the association's dust control study. A progress report will soon be distributed by the association on this study. The plan was to conduct studies in a new plant where dust control was built into the design and equipment, and another embracing dust control results obtainable in an older plant. He pointed out that 5 million dust particles per cu. ft. could be considered a safe level, but the industry should work toward a level of 2 million particles or less as an objective.

In the association study just completed in a new plant, the dust concentration ranged from one million to 5 million particles in various sample locations. Mr. Hatch pointed out that this plant had a very modern exhaust ventilation system of a new type. He said that choice of equipment and layout were even more important factors than the ventilation. To illustrate his point, he gave an improved elevator housing design as an example of what could be done to control dust. This plant also uses an oil spray on bags to cut down dust in the packing operation. The oil spray is a mixture of oil and water.

Mr. Hatch also referred to the South African mine study of dust control. This study in the period from 1920 to 1950 involved one million medical examinations of workers. Each man is examined once a year. Dust control measures in this period had resulted in an improvement in health conditions ten times over the conditions existing at the time the study was started.

Earl Andrews, chairman of the Advisory Committee on Health, in his report outlined a complete medical program and forms. The report will be sent to the members for study. Secretary Ahearn emphasized the importance of the June 16 meeting in Pittsburgh, Penn., where a forum will be conducted at Mellon Institute by the Industrial Hygiene Foundation. Mr. Andrews also urged that the members send representatives to this meeting.

Theo. Waters, counsel for the association, presented a progress report on legislative developments. He said that a more complete report will be presented at the October meeting.

At the final session, the financial report was presented and accepted. The election of officers and directors followed the recommendations of the nominating committee, previously reported.

Emery Durstine presented the report of the traffic committee. The committee recommended that the association take no stand in opposition to making permanent the 15 percent temporary rate increase granted to the railroads.

Ralph Lebold, chairman of the Advisory Committee on Labor, gave his report, and then called for a round-table discussion of company experiences in labor negotiations and relations with employes. It was indicated that the industry had been comparatively free of labor difficulties during the past year. However, considerable concern was expressed over the wage negotiations now under way between management and labor in the automobile industry, and the impact they would have on other supplying industries.

The Washington Scene

The address by Executive Secretary Ahearn on the Washington scene was the closing highlight of the convention to which the ladies were invited. Mr. Ahearn expressed the view that President Eisenhower would very likely run again due to the pressure of party leaders in spite of his inclination to retire to his farm in Pennsylvania and free himself of some of the distasteful features of public office. Internal political and world conditions, he felt, probably would have a bearing on President Eisenhower's decision to run again. Mrs. Eisenhower's health also would have his consideration. Mr. Ahearn pointed out the difficulties experienced by the President in having a divided party on many domestic and foreign issues, but he said that with the aid of conservative democrats his legislative program had been very largely passed.

Potash Expansion At Carlsbad

NATIONAL POTASH CORP. and Farmers Chemical Resources Development Corp., two new firms, plan to build multimillion dollar potash plants at Carlsbad, N. M. The former concern, owned jointly by Freeport Sulphur Co. and Pittsburgh Consolidated Coal Co., will build a $19 million plant with an annual capacity of 250,000 tons of K_2O. The other enterprise, owned 50 percent by National Farmers Union and 25 percent each by Kerr-McGee Oil Co. and Phillips Petroleum Co., will cost $12 to $15 million.

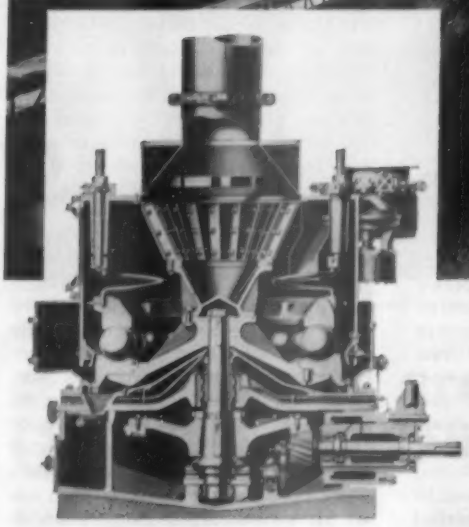
International Minerals & Chemical Corp., one of the five present potash producers in the area, is planning to expand its Carlsbad operation by 250,000 tons annually. These new developments parallel the continued steady growth of American potash consumption, which totalled over 2,000,000 tons (100 percent K_2O basis) in 1954. The predicted consumption for 1960 is 3,000,000 tons.

Directory Of Testing Laboratories

THE AMERICAN SOCIETY FOR TESTING MATERIALS, in its new "Directory of Commercial and College Testing Laboratories" (January 1955), lists the location of 278 commercial testing laboratories equipped and prepared to undertake testing on a commercial or fee basis; it also lists 86 colleges prepared to do testing under certain conditions. Nature of tests and types of commodities tested are also indicated. Price: $1.00

Chemical Industries Exposition

THE 25TH EXPOSITION OF CHEMICAL INDUSTRIES will be held at the Commercial Museum and Convention Hall, Philadelphia, December 5 to 9. The exposition will cover the many aspects of chemistry and chemical engineering that are applied throughout the industrial world.



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...B&W Type EL Pulverizers

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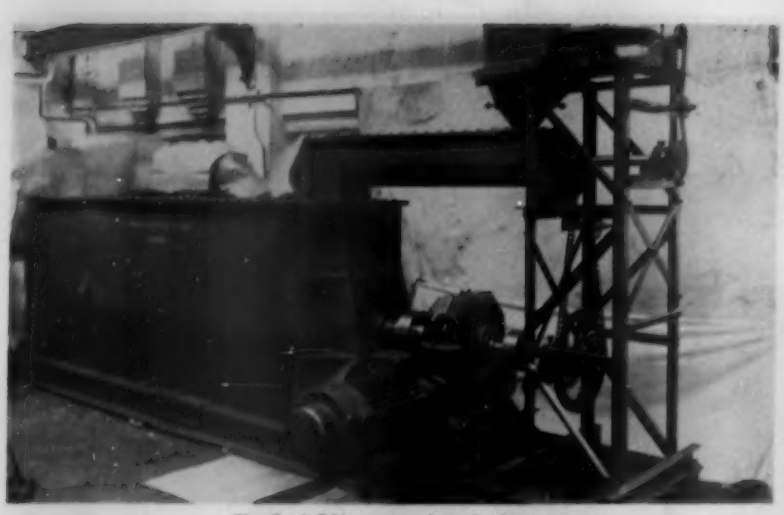

Fig. 3: A 2½-ton per hour hydrator

Increase Efficiency In

Hydration of Lime

Part 2: Aging Hydrated Lime

By N. V. S. KNIBBS*
AND E. G. S. THYER*

SOME SYSTEMS OF HYDRATION, formerly much used, sought to extend the period of hydration, without increasing the size of the hydrator itself, by passing the material from the hydrator to a storage silo (for this purpose called an "ageing" or "maturing" silo) where it remains, sometimes for 24 hr., before air separation. Anyone who has operated a plant with a maturing silo knows the practical difficulties entailed, particularly in feeding the hydrate out of the silo, but, apart from such defects, a consideration of the facts shows the underlying theory to be unsound. Lime is highly absorbent, especially when lightly burned, but, with exceptions to be mentioned later, even the best and most lightly burned lime absorbs little more than enough water for its hydration reaction, with nothing over to dissipate the heat of reaction by its evaporation. The harder burned lime, which is also slower in reaction, absorbs less water than is required for the chemical reaction alone. In the process of hydration the aim is to produce a final product that is substantially dry and therefore suitable for separation, yet in which all the oxide is changed to hydroxide. Suppose, for simplicity, the lime to the hydrator consists of 80 percent of highly reactive lime, which will hydrate completely in the time of passage through the machine and 20 percent of lime requiring a longer period. If enough water has been added to hydrate all the lime and dissipate in the hydrator the excess of reaction, the material discharged to the maturing silo will consist of substantially dry hydrate from the 80 percent of reactive lime plus unhydrated lime from the 20 percent less reactive lime plus the excess water (not reacted or evaporated).

This excess water will be absorbed by the unreacted lime but, because of evaporation, the amount so absorbed will be somewhat less than that originally held. Consequently the material coming to rest in the maturing silo will consist of dry hydrated lime mixed with pieces of quicklime, containing much too little water for complete hydration. If no cooling takes place in transferring the lime to the silo the temperature will be a little under 212 deg. F., a favorable temperature for hydration, and the temperature will be maintained by the heat of reaction of the remaining lime. But that lime, already containing too little water for complete hydration, will lose some of this water by evaporation due to the heat reaction (the water vapor condensing on the cooler surrounding hydrate or escaping from the silo altogether) and in the static mass there is no means, other than slow diffusion, by which more water can reach it. Maturing silos therefore do very little to assist hydration, and they are often worse than useless in that they may promote the disintegration by partial hydration of overburned lime to a size at which it passes the separation system although still containing quicklime.

It is evident that if the lime is finely ground before hydration, the mixture entering a maturing silo will be more nearly homogeneous and any particle of slow-slaking lime can much more easily acquire water from its surroundings, so that maturing can be beneficial. It may also be effective, or relatively effective, with certain highly absorbent limes such as some white chalk limes, which absorb enough water for hydration plus evaporation, or with impure limes which, because they require much less water for hydration and generate less heat, may also ab-

Fig. 4: Five-ton per hour hydrating plant at Totternhoe, England

*Knibbs & Thyer, consulting engineers, Longfield, Kent, England.

Oliver "OC-12" with hydraulic 1-yd. loader. This model has the long track frame for added stability. Loader has exceptional bucket rotation and 10' 4" loading height.

Another great tractor by Oliver ...THE POWERFUL "OC-12" CRAWLER!

It's a rugged, eager worker in the 45 drawbar h.p. class that features advancements in power, economy and operating ease to make every job more profitable.

The "OC-12" offers two engines of exceptional torque span—diesel or gasoline. Both engines have instant electric starting, pressure cooling, by-pass thermostat and full-flow oil system to insure quick starting and long, low-cost service.

The smooth lines of this unit show it is made for easy access and operator visibility. Controls are right where they're the handiest. Down to the key-lock switch, foam rubber seat, overhead-linkage clutch, this tractor caters to operator convenience.

Your Oliver Industrial Distributor will be glad to demonstrate the "OC-12." Give him a call.

The "OC-12" is available in two track widths: 44- and 60-inch—and two track lengths, one with four lower track wheels and one with five. Standard grousers are 14-inch.

Here is the "OC-12" with hydraulic bulldozer. Hydraulic pump is front mounted. Special protective grille is part of 'dozer frame. Blade has provision for tilt adjustment.

THE OLIVER CORPORATION
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a complete line of industrial wheel and crawler tractors

Fig. 5: Two 5-ton hydrators at Riddlesdown, England

sorb sufficient, and which may therefore enter the silo containing enough to complete the reaction.

It follows from all the foregoing discussion that a prime desideratum in a mechanical hydrator is means whereby the machine will automatically distinguish between slow and rapid-slaking lime, and will discharge the latter as soon as possible after reaction, while retaining the former until it is hydrated, the rapid passage of the fast lime balancing the long retention of the slow lime. Fortunately, the disintegration which accompanies the normal hydration of most limes provides a means of distinguishing between hydrated and unhydrated limes, and all that is necessary is to discover a means of discharging the fine hydrate while retaining the remainder of the lime. To avoid cooling, steam loss, etc. (which would greatly retard the reaction) such separation must be effected internally; in the hydrator itself. Theoretically, discharge through a fine screen would provide the separating mechanism but it is needless to point out the impracticability of this to anybody familiar with the nature of lime.

Fluidize With Selective Hydrator

A differentiating or selective hydrator was first produced in the later 1920's and a machine dating from about 1935 is shown in Fig. 3. It is, in effect, a trough mixer of special design, relatively short and deep. Some of the early hydrators of this type were made cylindrical, but they proved less satisfactory than the trough-shaped machines. In such a short large vessel the mixing of lime and water cannot be carried out efficiently, so the hydrator is preceded by a fast-running premixer. If hydration is carried out in a deep bed the steam evolved fluidizes that bed and changes its whole character, and although at the date of the inception of this machine the properties of "boiling" or "fluidized" beds were not well understood, it was found by experience that the fluidized condition could be used to operate the hydrator with a deep bed without high power usage. Steam evolution from a pure active lime is such that boiling is quite violent, and in such a bed, although the coarsest material tends to remain near the bottom, there is a range of particles which circulate rapidly throughout the fluidized bed. In the hydrator there is a short relatively stagnant zone at the feed end, where steam evolution, or the formation of fine hydrate (or both) is insufficient to produce a boiling bed, and by proper design, it is possible to arrange matters so that the boiling dies away a short distance from the discharge end. The material there is in a highly fluid condition, due to entrained steam, but it is not boiling, and the coarse and heavy particles sink through it leaving the fine hydrated lime at the surface, and it is this surface material that is discharged by overflowing a weir in the end-frame. The coarse unhydrated lime remains in the lower regions, recirculating backwards into the boiling bed, until it breaks up by hydration.

Because the greater part of the hydrator is fluidized, with the rapid circulation which characterizes a boiling bed, the fine hydrate formed can reach the weir and overflow within a very short time of its formation so that, in effect, the reactive product occupies only a small fraction of the total available space. Most limes, even those that are considered to be of the highest quality, contain a proportion of material which reacts slowly, and the kind of lime taken in our earlier example, with 80 percent active and 20 percent relatively inactive, is fairly typical. Consider what happens when such a lime is used in the selective hydrator. Such a hydrator may have an average retention time of 30 min., i.e., the hydrator holds one half its hourly output. Suppose the output is 8 tons an hour so that the hydrator holds 4 tons. The 80 percent of rapidly reacting lime may complete its hydration (at 210 deg. F., the temperature in the hydrator) in about 7½ min. (which is quite a normal figure), so that 6.4 of the 8 tons remains in the hydrator only 7½ min. and the amount in the hydrator at any time is

Fig. 6: Two 5-ton hydrators at Settle, England

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In this quarry at Colton, the powerful 150-B shovel with its 6-cu. yd. dipper has no difficulty in breaking through tough limestone.

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In a California quarry, this Bucyrus-Erie 150-B shovel is digging and loading hard limestone, delivering outstanding output. This performance story is being repeated daily in quarries, mines and on heavy-duty construction projects throughout the world.

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Fig. 8: Ten-ton hydrator at Beechville, Ontario, Canada

Fig. 7: A 5-ton hydrator, showing the constant-weight feeder and the interesting instrument panel

only 6.4 x 7.5 ÷ 60 = 0.8 tons, leaving space for 3.2 tons of the less reactive lime. This lime, 1.6 tons an hour, will therefore remain in the hydrator an average of 3.2 ÷ 1.6 = 2 hr. Since some of the 20 percent will need much less than 2 hr., there is room for much longer retention of any very inactive lime.

The hydrator shown in Fig. 3 is a small one, with a capacity of only two tons an hour. Hydrators of higher capacity such as those shown in Figs. 4, 5, 6, and 8 were evolved from this one without increasing the length, which was chosen primarily to avoid an internal bearing. As the hydrator size was increased in diameter and height its selectivity increased, so that the effective capacity increased more than the volumetric capacity. The power required per unit of output also decreased.

An important feature of the selective fluidized hydrator is the way in which the power taken to drive the stirring arms varies with conditions in the machine. It was found that the power required is a minimum when conditions are exactly correct for hydration and that it rises either side of the correct conditions, the rise being sharper when too little water is used. This minimum power for optimum hydrator conditions was certainly not expected before it was found in practice, but now that the nature of a fluidized bed is better understood, the reason for it is fairly obvious. The best conditions for hydration are those in which the maximum possible amount of water is used consistent with the discharge of substantially dry hydrate, which entails a maximum amount of water vaporized in the hydrator. This, in turn, entails a maximum degree of fluidization and it is fluidization which decreases power. A fully fluidized hydrator, indeed, takes scarcely any more power than when the machine is running empty.

When too much water is used, the degree of fluidization decreases and the load goes up, but the increase is not sharp until there is a considerable excess of water, and load does not afford a sensitive control. On the other hand, it is very sensitive to water deficiency. If there is insufficient water to dissipate the excess heat by evaporation the temperature in the hydrating mass rises above 212 deg. F., but before any increase can be detected, even on a sensitive pyrometer, another phenomenon intervenes. This is the coherence of the hydrate particles and their adherence to the stirring mechanism, due, apparently, to electrification, because it takes place as soon as all free moisture disappears. The cohering powder grows as a soft mass from the stirrers until it touches the side, at which point the load increases sharply. It also fluctuates violently due to unevenness of the "dry ball" which at first touches the side only during part of a revolution. Water played on to this "dry ball" breaks it

(Continued on page 76)

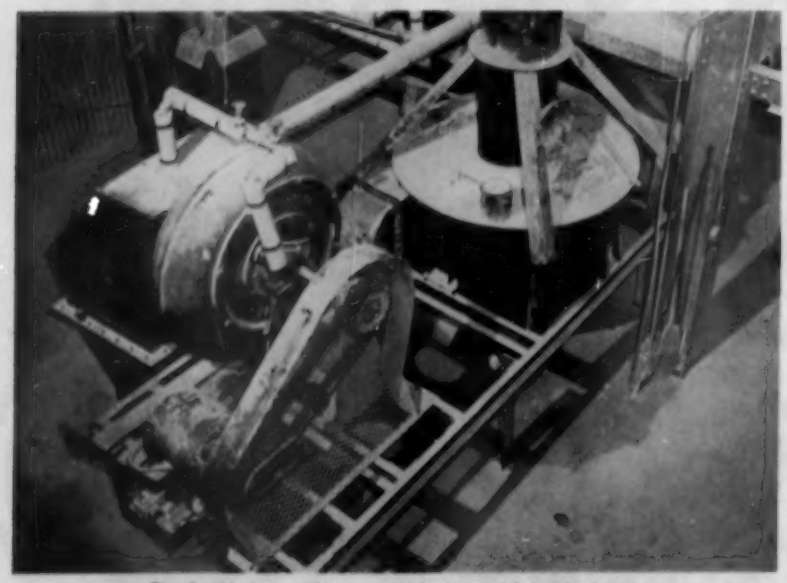

Fig. 9: Washer-preheater attached to a 10-ton hydrator

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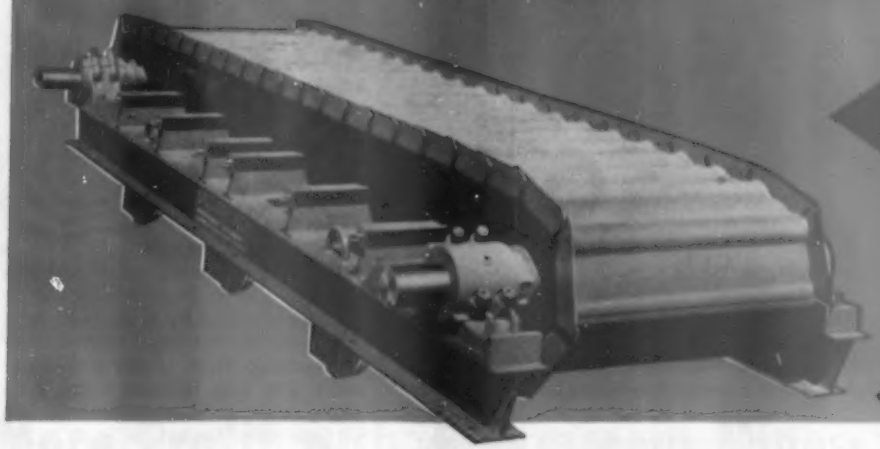

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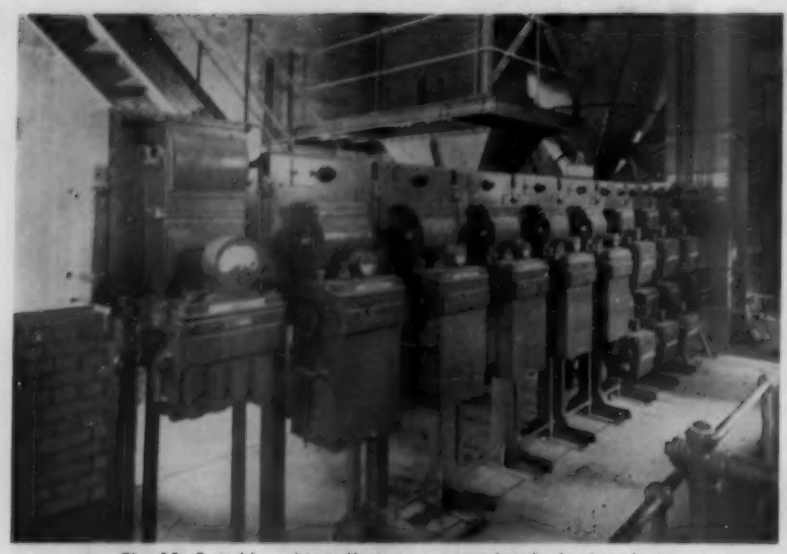

Fig. 11: Switchboard installation at a complete hydrating plant

up very rapidly and "boiling" is resumed.

If the lime feed was free from unburnt stone and other unhydrated material the hydrator could continue indefinitely discharging by overflow, but in practice there is always some residue, which accumulates in the machine and occupies useful space, reducing the retention time. It also increases the load on the stirring mechanism. This heavy residue is removed from the hydrator at intervals through a bottom valve. In the exceptional instances when it is necessary to hydrate a lime containing a high proportion of unhydrated residue a continuous residue extractor is used.

Washer-Preheater Developed

Concurrently with the selective hydrator there was developed a "washer-preheater" which has since then always formed an integral part of the complete hydrator. Hydrating plants had hitherto been dusty places, and the loss of much of the finest hydrate, mostly entrained in the steam leaving at the exhaust stacks, whitened the surroundings and represented an important item of cost. The washer-preheater was developed to avoid this loss, but it was found to have an equally important function: that of preheating the water used for hydration nearly to boiling point. The efficiency of dust recovery is such that losses are entirely negligible: steam alone comes from the exhaust stack. The recovered dust returns to the hydrator in suspension in the preheated water.

The washer-preheater, which can be seen in Fig. 9, is a simple piece of equipment, development since its inception being always in the direction of simplification. A "fan - washer" draws the steam and dust from the hydrator, keeping the whole system under very slight suction, and therefore dustless, and the cold feed water, also entering the fan and wetting every part of it, traps the dust and is heated to boiling-point by the steam condensed. An eliminator after the fan removes spray.

Some limes are so rapid in their reaction with water that preheating is unimportant, but the greater number of those treated in commercial hydrators are slow in commencing to react with cold water, and efficient preheating makes an enormous difference to the rate and therefore to the through-put of the plant.

The selective hydrator utilizes fluidity and gravity to distinguish between fine hydrate and unhydrated lime, but its selectivity has not hitherto been sufficiently exact to dispense with all subsequent classification, except in less exacting uses of hydrated lime. The higher selectivity required to make the fluo-bed hydrator a complete self-contained hydrating plant — taking in quicklime and discharging hydrate of any desired degree of fineness — is the latest development in this field (U.S. Patent 2,611,683 and Brit. Patent 637,756). To achieve it, the fluidizing action of the evolved steam is supplemented by additional recirculated steam, the two together providing sufficient volume to carry the fine hydrate out of the fluidized bed to a separating chamber.

Fig. 10: Hydrator instrument panel with water control and flow meter, pyrometer indicator and ammeter

Mechanical Wet Slaking

The mechanical slaking of lime with excess of water is carried out in a wide variety of equipment, often made to suit the chemical process in which the lime is to be used. In most chemical processes slaking is carried out in the liquid to be treated with lime or in washings from a previous treatment. The lime industry is more directly concerned with the production of lime putty for sale as such or for mixing with sand in ready-mixed mortar, and there have been several types of mechanical putty plants offered. In all instances the slaker is an agitated tank into which the lime is charged continuously or in batches, and both cylindrical and trough-shaped tanks have been used. The slaked lime, in the form of a thin cream, is sometimes pumped through a vibrating screen or wet classifier, and sometimes taken from a part of the slaker from which sediment has settled. Unslaked residue is removed from the screen or from the tank itself, either by a rake or a worm conveyor, and the water for slaking is used to wash this residue free from slaked lime.

The thin cream of lime is pumped to storage tanks for settlement or dewatering to the putty consistency desired, and because the rate of settling, and therefore of thickening, generally varies inversely with the plasticity of the putty it may be a slow process with lime of the highest quality. For this reason, dewatering in some putty plants is accelerated by using a thickener of large area and in others by ageing, thickening and storing in deep cylindrical tanks in which there are one or more vertical draining tubes, perforated but with the perforations covered by a filtering surface which passes the water but retains the lime. The lime water which is recovered from the dewatering process is used to slake more lime.

Hydration Under Pressure

Hydration under pressure has been employed in the preparation of hydrated lime for use in sand-lime brick for a very long time, and batch pres-

(Continued on page 104)

One of approximately 1200 on the Minnesota Iron Ranges, this 34-ton "Euc" is loaded by a 5 cu. yd. shovel at a large open pit operation. Rear-Dump models are available with semi-rigid or spring mounted axles, Allison Torqmatic drives and transmissions, or conventional 5 and 10 speed transmissions.

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■ Your Euclid Distributor will provide a hauling production and cost estimate for your operation . . . there's no obligation so get in touch with him soon. Have him show you how Euclid equipment can improve your profit picture.

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

This Bottom-Dump "Euc" is being loaded with 17 cu. yds. of sand and gravel from an overhead hopper for haul to the washing plant. Owner is Interstate Sand and Gravel of Covington, Ohio.

Ideal Cement Co. of Portland, Colorado uses 22-ton Rear-Dumps with quarry bodies to haul stone from the face to the crusher. Top speed of this Model 36 TD, with full payload, is 32.5 m.p.h. Spring mounted drive axle and Allison Torqmatic drive and transmission are important factors in stepping up production and profits at this quarry operation.

Euclid Twin-Power Scraper stripping overburden at a large gypsum quarry in Iowa. Powered by two 190 or 200 h.p. engines with torque converters and semi-automatic transmissions, this "Euc" self loads, has a struck capacity of 18 cu. yds. and travels up to 30 m.p.h. with full payload.

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New Study On Reactions In Burning Cement Raw Materials

By L. A. DAHL*

Part III: Procedure in computation of phase composition

TO ILLUSTRATE THE PROCEDURE in computation of phase composition, let us consider the problem of calculating the weight fraction of liquid E in a mixture of the composition 70.15 percent CaO, 8.30 percent Al_2O_3, 21.55 percent SiO_2. Liquid E, which is capable of existing in equilibrium with solid C_3S, C_2S and C_3A at 1455 deg., has the composition 58.3 percent CaO, 33.0 percent Al_2O_3, 8.7 percent SiO_2. As this liquid is formed it withdraws CaO, Al_2O_3 and SiO_2 from the solid portion of the mixture in the proportions required for its formation, as indicated in the composition of the liquid. Let m represent the weight fraction of liquid at any given time. Then in 100 grams of mixture, the components in the solid residue are as follows:

Grams CaO = $70.15-58.3m$ (4)
Grams Al_2O_3 = $8.30-33.0m$ (5)
Grams SiO_2 = $21.55-8.7m$ (6)

For any value of m, from zero to a certain maximum, the equations will give the percentages of CaO, Al_2O_3 and SiO_2 in the solid residue, expressed in terms of the mixture as a whole. The maximum value of m remains to be determined. It is apparent that m cannot exceed 8.30/33.0, or 0.2515, since the Al_2O_3 in the residue is then zero, and no Al_2O_3 remains for continuing the formation of liquid. However, this method of determining the maximum value of m assumes that any residue which remains is capable of existing in equilibrium with liquid E. This assumption is not sound. The residue must consist only of solid phases capable of existing in equilibrium with liquid E; that is, one or more of the phases C_3S, C_2S and C_3A. To obtain a value of m which will leave such a residue, the compositions of both liquid E and the mixture may be expressed in terms of C_3S, C_2S and C_3A. The potential compound composition of each may be computed by substitution in equations 1-3, obtaining the compositions indicated below:

	Mixture	Liquid E
C_3S	66.1%	-50.4%
C_2S	11.9	63.0
C_3A	22.0	87.4
	100.0%	100.0%

The potential C_3S in liquid E is negative because liquid E is outside of triangle C_3S-C_2S-C_3A in a direction away from the C_3S vertex, as shown in Fig. 4. The potential compositions are used in setting up equations similar to equations 4-6, as follows:

Solid C_3S = $66.1+50.4m$ (7)
Solid C_2S = $11.9-63.0m$ (8)
Solid C_3A = $22.0-87.4m$ (9)

The value of m is the smallest value which will reduce one of the equations to zero. From equation 8, $m=11.9/63.0$, or 0.1889. From equation 9, $m=22.0/87.4$, or 0.2517. The smaller of these values, 0.1889, is the maximum value of m to be applied in equations 4-6 or 7-9. Substituting in equations 7-9, we obtain the following:

Solid CaS = $66.1+50.4 \times 0.1889 = 75.62\%$
Solid C_2S = $11.9-63.0 \times 0.1889 = 0.00$
Solid C_3A = $22.0-87.4 \times 0.1889 = 5.49$
Liquid E = 100×0.1889 = 18.89
100.00%

The percentages of phases obtained by the foregoing method is in harmony with the required conditions, that the amount of liquid attains a maximum through the disappearance of one of the solid phases, and that the residue is composed of phases capable of existing in equilibrium with the liquid.

Comparison with the Quaternary System CaO-Al_2O_3-SiO_2-Fe_2O_3

The quaternary system CaO-Al_2O_3-SiO_2-Fe_2O_3 has been investigated with reference to portland cement technology by Lea and Parker[7, 8] and by Swayze.[9] Lea and Parker investigated the system CaO-C_2S-C_3A_3-C_4AF. The compound $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$, designated here as C_4AF, had been reported earlier by Hansen, Brownmiller and Bogue[10] as the ferric oxide compound in portland cement, and was therefore selected as one of the components of the system to be investigated. In his investigation of the ternary system CaO-C_3A_3-C_2F, Swayze discovered the existence of a complete series of solid solutions from C_2F to a new compound, C_6A_2F. The composition C_4AF is in this series. In

(Continued on page 82)

*Former senior research mathematician, Portland Cement Association Research and Development Laboratories, Chicago, Ill.

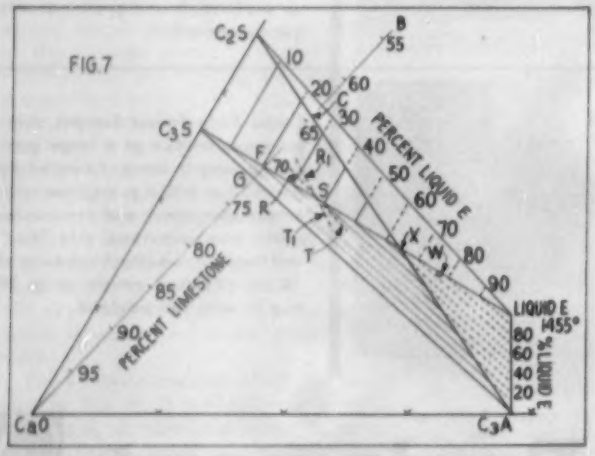
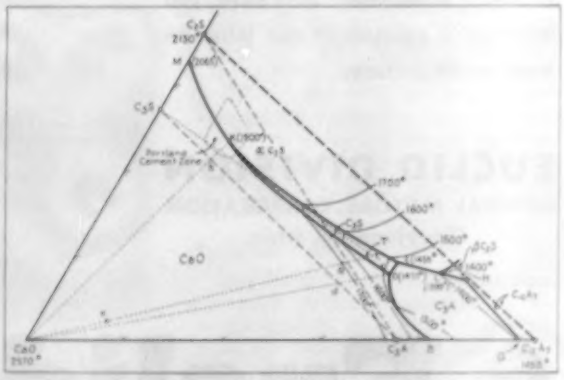


Fig. 7: Percent liquid at 1455 deg. (max. heat content)

Fig. 4: The system CaO-C_2S-$C_{12}A_7$, shown below



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Calcining Reactions

(Continued from page 78)

order to include the entire solid solution series in the quaternary system under investigation, it was necessary to investigate the system CaO-C_2S-C_3A_3-C_4F, which includes a wider range than the system investigated by Lea and Parker. Since some of the data required for mathematical treatment are lacking in Swayze's investigation, we will base our studies here on Lea and Parker's data.

A space model in the form of a tetrahedron is required for representation of a quaternary system. It will not introduce complexities in this study, since the method of computation which has been described will be used to avoid such difficulties. The system within the quaternary system which corresponds to the system C_3S-C_2S-C_3A in the ternary system is the system C_3S-C_2S-C_3A-C_4AF. Portland cement clinker may be made from mixtures in either system, but those in the quaternary system may be burned at a lower temperature, and resemble commercial clinker more closely because of the presence of Fe_2O_3, which is a constituent of all commercial cements. The potential composition of mixtures in the system C_3S-C_2S-C_3A-C_4AF may be calculated by substitution in the following equations:

$$C_3S = 4.0715\ CaO - 7.5996\ SiO_2 - 1.4297\ Fe_2O_3 - 6.7182\ Al_2O_3 \quad (10)$$

$$C_2S = 8.5996\ SiO_2 + 1.0786\ Fe_2O_3 + 5.0682\ Al_2O_3 - 3.0715\ CaO \quad (11)$$

or

$$C_2S = 2.8665\ SiO_2 - 0.7544\ C_3S \quad (11a)$$

$$C_3A = 2.6501\ Al_2O_3 - 1.6919\ Fe_2O_3 \quad (12)$$

$$C_4AF = 3.0431\ Fe_2O_3 \quad (13)$$

With the exception of terms involving Fe_2O_3, equations 10-12 are identical with equations 1-3.

The point in Lea and Parker's quaternary system corresponding to point E, Fig. 4, in the ternary system is designated as invariant point T_3. The liquid at this point is capable of existing in equilibrium with solid C_3S, C_2S, C_3A and C_4AF at 1338 deg. The oxide composition and the potential compound composition of liquid T_3 are given below, the latter computed by substitution in equations 10-13.

Composition of liquid T_3

Oxides		Compounds	
SiO_2	6.0%	C_3S	1.4%
Al_2O_3	22.7	C_2S	16.2
Fe_2O_3	16.5	C_3A	32.2
CaO	54.8	C_4AF	50.2

In the ternary system we found that the potential C_3S at point E is negative, indicating that the point is outside of the triangle C_3S-C_2S-C_3A in a direction away from the C_3S vertex. It was this condition that led to the presence of larger quantities of solid C_2S when liquid E is present than when crystallization is complete. The situation is not the same in the quaternary system. At point T_3 the potential percentages of the compounds are all positive. The potential C_2S is a small positive value, indicating that point T_3 is barely inside the tetrahedron C_3S-C_2S-C_3A-C_4AF. Lea and Parker express some doubt as to whether the point is inside the tetrahedron (a eutectic) or outside (a peritectic), since small changes in the composition of the point, within the experimental error of determination, could place it on either side of the face of the tetrahedron. For our purpose it will be assumed that the reported composition is not subject to any error of this kind.

As an example of the computation of phase composition, we will consider the problem of calculating the percentages of solid phases and liquid T_3 in a mixture having the potential composition 44.8 percent C_3S, 35.6 percent C_2S, 7.0 percent C_3A, 12.6 percent C_4AF. Equations for the percentages of solid phases may be set up in the same manner as equations 7-9, with m representing the weight fraction of liquid T_3, as follows:

$$\text{Solid } C_3S = 44.8 - 1.4m \quad (14)$$

$$\text{Solid } C_2S = 35.6 - 16.2m \quad (15)$$

$$\text{Solid } C_3A = 7.0 - 32.2m \quad (16)$$

$$\text{Solid } C_4AF = 12.6 - 50.2m \quad (17)$$

Equating each of the right-hand members to zero, and solving for m, it is found that equation 16 gives the lowest value of m, that is, 7.0/32.2, or 0.217. Substituting in the equations, we find that

Solid C_3S	=	44.5%
Solid C_2S	=	32.1
Solid C_3A	=	0.0
Solid C_4AF	=	1.7
Liquid T_3	=	21.7
		100.0%

Equations 14-17 refer to one particular mixture in the system, for which the C_3A equation gave the lowest value of m, indicating that the potential C_3A determines the percent of liquid T_3. In view of the complete range of compositions of mixtures in the system it may be readily understood that in one range of compositions the potential C_3A determines the percent of liquid, in another the potential C_2S is the governing factor, etc. The four regions correspond to the areas C_3S-C_2S-X and C_2S-C_3A-X, Fig. 7, in which the percent liquid is determined by the potential C_3A or C_2S, respectively. In the space model of the quaternary system these regions are separated by planes meeting at the point T_3.

In the cement industry the compounds C_3A and C_4AF are frequently referred to as "fluxes." The Al_2O_3 and Fe_2O_3 which enter into the formation of these compounds are present in the raw materials from which portland cement clinker is made, and are not commonly added to the raw mix to serve as fluxes. However, since they play a part in promoting fusion, they may be regarded as fluxes to the extent that they serve that purpose. Since it has been found that the percent of liquid is governed by the potential percentage of the compound which disappears when the liquid is formed, it is preferable to refer to the compounds, rather than the oxides, as fluxes. When the potential percentage of a particular compound determines the percent of liquid, the compound may be regarded as a flux, since it promotes fusion. However, the effect of increasing the quantity of that compound on the degree of fusion does not continue indefinitely. For example, consider a mixture at point R, Fig. 7, which is in the region in which the potential C_3A governs the percentage of liquid E. The dotted line RT is in a direction directly toward the C_3A point, and represents increasing potential C_3A. When the potential C_3A is increased to a point beyond S, such as T, the mixture is no longer in the region in which the potential C_3A governs the percentage of liquid. Point T is in the region in which the potential C_2S governs the percentage of liquid. The quantity of liquid is lowered in passing from S to T, but can be increased by increasing the potential C_2S. In considering fusion at 1455 deg. when the liquid phase is at E, C_3A is the flux in one region and C_2S in the other. Similarly, in the quaternary system, C_2S, C_3A or C_4AF may be regarded as a flux in the process of fusion at 1338 deg. when the liquid phase is at T_3. Each of these compounds has a particular field of influence on the degree of fusion. The compound C_2S is ignored here because the potential C_2S at invariant point T_3 is so small that it is uncertain whether the point is eutectic or peritectic. In either case, it is negligible in dealing with portland cement compositions.

As in the ternary system, the quantity of liquid is proportional to the

(Continued on page 84)

Model D *Standard* (GASOLINE ENGINE)

STANDARD EQUIPMENT: Six-volt electrical system, two headlights, one rear and stop light, muffler, 10-ft by ⅝-in. moldboard, hydraulic controls for moldboard lift, four 7.50-20 rear and two 6.50-16 front tires with tubes.

Total weight	8,800 lb	Blade pressure	4,900 lb
Wt. on front wheels	2,700 lb	Four speeds forward to	25.6 mph
Wt. on rear wheels	6,100 lb	Reverse to	3.3 mph

Model D *Special* (GASOLINE ENGINE)

FULLY EQUIPPED AS FOLLOWS: Six-volt electrical system, two headlights, one rear and stop light, muffler, 10-ft by ⅝-in. hydraulically shiftable moldboard, 6-valve control group, four 8.25-20 rear and two 8.25-20 front tires with tubes, front wheel lean, power circle turn, hydraulic scarifier, all-steel cab.

Total weight	10,900 lb	Blade pressure	6,450 lb
Wt. on front wheels	3,750 lb	Scarifier pressure	4,900 lb
Wt. on rear wheels	7,150 lb	Four speeds forward to	25.6 mph
		Reverse to	3.3 mph

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50 - hp diesel engine with follow-through combustion

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Model D Diesel *Standard*

STANDARD EQUIPMENT: Twelve-volt electrical system, two headlights, one rear and stop light, muffler, 10-ft by ⅝-in. moldboard, hydraulic moldboard lift controls, four 7.50-20 rear and two 6.50-16 front tires with tubes.

Total weight	9,350 lb	Blade pressure	4,900 lb
Wt. on front wheels	2,760 lb	Four speeds forward to	25.2 mph
Wt. on rear wheels	6,590 lb	Reverse to	3.2 mph

Model D Diesel *Special*

FULLY EQUIPPED AS FOLLOWS: Twelve-volt electrical system, two headlights, one rear and stop light, muffler, 10-ft by ⅝-in. hydraulic shiftable moldboard, 6-valve control group, four 8.25-20 rear and two 8.25-20 front tires with tubes, front wheel lean, power circle turn, hydraulic scarifier, all-steel cab.

Total weight	11,450 lb	Blade pressure	6,450 lb
Wt. on front wheels	3,750 lb	Scarifier pressure	4,900 lb
Wt. on rear wheels	7,700 lb	Four speeds forward to	25.2 mph
		Reverse to	3.2 mph

You can still buy a model D for one-third the cost of a large motor grader, and it's the most popular, most versatile small grader on the market. In addition to the units illustrated, the Model D is available with other combinations of accessories . . . or with any of these useful attachments: rear-mounted ⅝-cu-yd loader; shoulder maintainer; one-pass windrow eliminator; V or blade-type snowplows. Ask your nearby Allis-Chalmers dealer for a demonstration . . . and prove the Model D's value.

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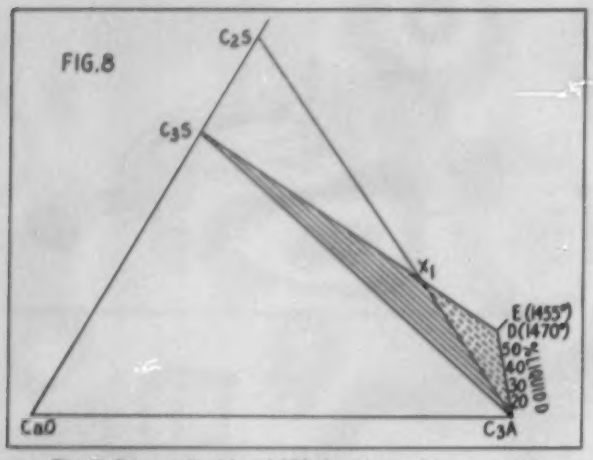

Fig. 8: Percent liquid at 1470 deg. (max. heat content)

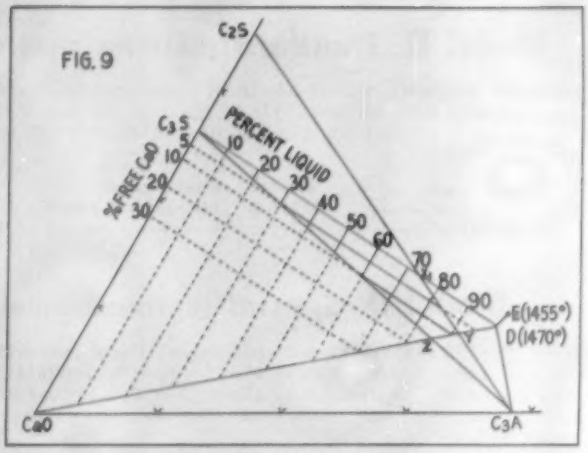

Fig. 9: Percent liquid and free CaO at 1470 deg. (max. heat content)

potential C_3S in low C_2S compositions at the temperature of liquid formation. This is in line with experience in the commercial process, that low C_2S compositions are difficult materials to burn.

Changes in composition may play a part in the sloughing off of clinker coating or the development of rings in the hot zone of the kiln. The line R_1T_1 in Fig. 7 has been introduced to illustrate the condition. The line is drawn at an angle of 60 deg. with the base CaO-C_3A, so that all compositions on the line are identical in CaO content. The SiO_2/Al_2O_3 ratio increases in passing from T_1 to R_1. The liquid content increases in passing from R_1 to S, and then decreases in passing on to T_1. Let us suppose that composition R_1 is maintained in the kiln, and that a coating of that composition has been built up. If the SiO_2/Al_2O_3 ratio in the clay or shale drops, so that the clinker has the composition T_1, there is opportunity for development of a greater liquid content, such as S, at the contact between clinker and coating. This may lead to sloughing off clinker coating in some instances, or building up clinker coating in others, depending upon the general level of compositions maintained. The effect of an abrupt change in SiO_2/Al_2O_3 ratio is the same whether the ratio increases or decreases. The possibility of its occurrence depends upon the basis for composition control. For example, with a constant CaO content, as on the line R_1T_1, a change in SiO_2/Al_2O_3 ratio may cause the liquid content to rise to a maximum, as at S, and then to fall. With a constant potential C_3S the liquid content may rise to a maximum as the SiO_2/Al_2O_3 ratio decreases, and the liquid content then remains constant, not falling, with further decrease in the ratio. The choice of basis for composition control may be important in avoiding some abnormalities in retention of clinker coating.

Equilibria above the Temperature of Liquid Formation

So far we have considered equilibria at the temperature of liquid formation, which is 1455 deg. in the ternary system C_3S-C_2S-C_3A, and 1338 deg. in the quaternary system C_3S-C_2S-C_3A-C_4AF. Higher temperatures may be employed to increase the quantity of liquid, to accelerate the chemical reactions involved in the production of portland cement clinker. States of equilibrium in the ternary system at higher temperatures will now be considered.

It has been shown in the study of Fig. 7 that at maximum heat content at 1455 deg. the phases in mixtures in triangles C_3S-C_2S-E and C_2S-C_3A-E are those indicated at the vertices. With further heating the temperature rises, and the liquid follows a boundary curve. It should be noted that E (Fig. 4) is at the intersection of three boundary curves, and can be considered as being on each one of the three curves. The solid phases present when the heat content is at a maximum at 1455 deg. indicates the boundary curve which will be followed when the temperature is raised. For example, a mixture in the triangle C_3S-C_2S-X consists of solid phases C_3S, C_2S and liquid E at 1455 deg. maximum heat content. As the temperature is raised, the liquid follows the boundary between the C_3S and C_2S primary phase regions, starting at E (Fig. 4). Similarly, when the temperature of a mixture in the triangle C_3S-C_3A-X is raised above 1455 deg. the liquid follows the boundary between the C_3S and C_3A primary phase regions.

Referring to Fig. 4, it is seen that the boundary between the C_3S and C_2S primary phase regions passes from E almost directly toward the C_2S point. Point W in Fig. 7 is on this boundary, near the 1600 deg. isotherm. As mixtures in the triangle C_3S-C_2S-X are heated to about 1600 deg., the liquid is at point W. If lines were drawn from W to the C_3S and C_2S points, the triangle so formed could be treated in the same manner as the triangle C_3S-C_2S-E to indicate percentages of liquid. The quality of liquid is proportional to the potential C_3A, as at 1455 deg., but the proportionality factor is larger. There is nothing in this case to indicate that undesirable effects will be encountered through raising the temperature to increase the degree of fusion.

In the case of mixtures in the triangle C_3S-C_3A-X, Fig. 7, the liquid follows the boundary between the C_3S and C_3A primary phase regions, starting at E, when the temperature rises above 1455 deg. Referring to Fig. 4, it is seen that this boundary is short, and that at 1470 deg. another invariant point, D, is encountered. At this point CaO, C_3S and C_3A may exist in equilibrium with the liquid. The relation between composition and percent liquid when the liquid arrives at D (minimum heat content at 1470 deg.) is shown in Fig. 8. The triangle C_3S-C_3A-D is narrower than triangle C_3S-C_3A-E, Fig. 7, but is similar in the fact that the potential C_3S governs the quality of liquid. A different situation appears when the heat content at 1470 deg. is a maximum.

Liquid D is capable of existing in equilibrium with solid CaO, C_3S and C_3A. There are four combinations of these phases in groups of three, as follows:

1. C_3S-C_3A-liquid D
2. CaO-C_3S-C_3A
3. CaO-C_3S-liquid D
4. CaO-C_3A-liquid D

Combination 1 has just been consider-

(Continued on page 86)

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(Continued from page 84)

ed, and refers to minimum heat content at 1470 deg. Combination 2 also refers to minimum heat content, but only for mixtures in the system CaO-C_3S-C_3A, which crystallize completely at 1470 deg. Combinations 3 and 4 refer to maximum heat content. This may be seen by examining Fig. 3, ROCK PRODUCTS, May 1955, p. 72. It may be seen from the fact that, starting at D on the boundary between the CaO and C_3S primary phase regions or on the boundary between the CaO and C_3A regions, the temperature rises.

Combinations 3 and 4 are represented by the corresponding triangles in Fig. 9. Triangle CaO-C_3A-D will not be discussed, since the portion of the system C_3S-C_2S-C_3A which it includes is of no interest in relation to portland cement. The triangle CaO-C_3S-D includes considerable area in addition to that in the system C_3S-C_2S-C_3A. Since the portion in that system is of particular interest, the lines referring to percentages of liquid D and free CaO are solid lines in the triangle C_3S-C_2S-C_3A, and broken lines outside of that triangle.

In Fig. 9, lines are drawn parallel to the side CaO-C_3S to indicate 10 percent intervals in percentage of liquid D. Since potential percentages of C_3A may also be represented by lines parallel to the same line, as in Fig. 5, (ROCK PRODUCTS, June, 1955, p. 102), the quantity of liquid is proportional to the potential C_3A. This is a decided change from the conditions at minimum heat content at the same temperature. The quadrilateral C_3S-X_1-Y-Z, Fig. 9 (maximum heat content) is a part of the triangle C_3S-C_3A-X, in Fig. 8 (minimum heat content), in which the quantity of liquid is proportional to the potential C_3S.

It was shown in our study of Fig. 7 that for ternary cement mixtures of low potential C_3S, at the lowest clinkering temperature, 1455 deg., the percent of liquid is proportional to the potential C_3S. This is shown by the closely spaced lines in that figure. The small increase of 1.2 percent in the proportion of limestone in passing from F to G is accompanied by a decrease in liquid content about 20 percent to zero. Close control of proportions of raw materials would be required to secure an adequate degree of fusion at this low clinkering temperature. Since high potential C_3S and a corresponding low potential C_2S are sought in the manufacture of high-early-strength cement, it is of interest to consider the effect of raising the temperature of burning. As the temperature of low C_3S ternary mixtures is raised from 1455 deg. to 1470 deg., the liquid passes from E to D, Fig. 4. When the liquid arrives at D, the percent of liquid is still proportional to the potential C_3S, as shown in Fig. 8. However, the lines representing percent liquid are more closely spaced than in Fig. 7, so that for any given composition in the low C_3S range the percent liquid is about 1.3 times as great as at 1455 deg. With further application of heat, there is a substantial increase in percent of liquid without change of temperature, as shown in Fig. 9. However, the advantage of a higher liquid content is offset by the fact that free CaO is present as an equilibrium phase. The percentages of free CaO are represented in Fig. 9 by lines parallel with the C_3S-D line. Since free CaO is an equilibrium phase in that region, it will remain present as long as the temperature is maintained at 1470 deg. and if no heat is withdrawn. It may be noted that the CaO-C_3S boundary in Fig. 4 from point D to the intersection with the 1700 deg. isotherm is nearly straight and practically coincident with a straight line from the C_3S point to D. The percent of free CaO present as an equilibrium phase in low C_3S compositions, therefore does not change to any great extent when the temperature is raised from 1470 deg. to 1700 deg. The free CaO present at equilibrium at or above 1470 deg. will disappear only as the temperature is reduced below 1470 deg., but with practical rates of cooling such as would be possible in a rotary kiln the reduction of free CaO content is likely to be negligible. The best way of avoiding this situation is to maintain compositions on the low CaO side of the C_3S-D line. Ternary compositions on the high CaO side may be burned to a low free CaO content by maintaining temperatures between 1455 deg. and slightly below 1470 deg. for a sufficient period of time.

In the ternary system CaO-Al_2O_3-SiO_2, the CaO primary phase region extends outside of the triangle CaO-C_3S-C_3A, and is partly in the triangle C_3S-C_2S-C_3A. It is this condition which makes it possible for free CaO to be an equilibrium phase in ternary portland cement mixtures under some conditions, as has been described. A similar situation exists in the case of the quaternary system CaO-Al_2O_3-SiO_2-Fe_2O_3, as reported by Lea and Parker[7, 9] in which the CaO primary phase volume extends outside of the tetrahedron CaO-C_3S-C_3A-C_4AF. A similar situation appears in Swayze's report[7] of the system CaO-Al_2O_3-SiO_2-Fe_2O_3 as modified by magnesia, in which the CaO primary phase volume extends outside of the tetrahedron CaO-C_3S-C_3A-C_4A_3F. It consequently appears that the presence of free CaO as an equilibrium phase may be expected when burning commercial portland cement raw mixtures of low potential C_3S content, as has been found in the ternary system CaO-Al_2O_3-SiO_2.

It has been shown in the discussion of Fig. 5 (ROCK PRODUCTS, June, 1955, p. 102) that the line C_3S-C_3A is the theoretical lime limit. All compositions between that line and the CaO vertex contain CaO in excess of the amount necessary to form C_3S and C_3A. This places a limit upon the amount of CaO which can be present in a ternary cement mixture. From the foregoing study of the presence of free CaO as an equilibrium phase in low C_3S mixtures, when burned at high temperatures, it may be seen that there is another kind of lime limit, representing a lime content which should not be exceeded if free CaO as an equilibrium phase is to be avoided.

An investigation by Spohn[11] had for its purpose the establishment of the "lime limit" of portland cement. The compositions of mixtures at the lime limit found by Spohn were located on the line C_3S-D. This lime limit was termed the "technical lime limit" by Spohn, to distinguish it from the theoretical lime limit, which is the line C_3S-C_3A. The equation of the line is therefore:

$$CaO = 2.80\ SiO_2 + 1.18\ Al_2O_3 \quad (18)$$

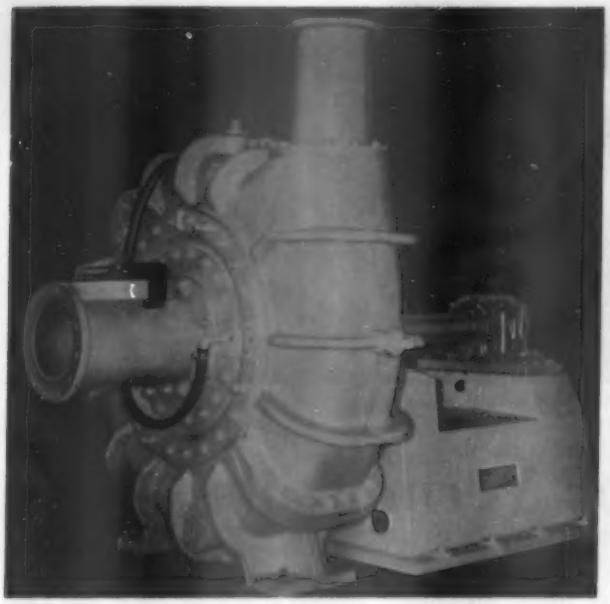
Lea and Parker[9] have examined their data on the quaternary system CaO-Al_2O_3-SiO_2-Fe_2O_3 with reference to a technical lime limit in that system on a basis similar to Spohn's technical lime limit. Their solution of the problem, which is in harmony with Spohn's remarks on the quaternary system, is that the lime limit in the quaternary system is represented by a plane passing through the C_3S and C_4AF points and through point D. The equation of the plane is:

$$CaO = 2.80\ SiO_2 + 1.18\ Al_2O_3 + 0.65\ Fe_2O_3 \quad (19)$$

Since minor constituents of portland cement are not represented in the equation, it can only represent approximately the technical lime limit in commercial portland cement clinker.

Lea and Parker define the lime "saturation factor" of a cement clinker as the ratio of the actual CaO content to the technical lime limit, as found by substitution in equation 19. The saturation factor of a cement may be found similarly, if the CaO derived from gypsum, that is, 0.70 times the percent SO_3, is deducted

(Continued on page 98)



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By W. P. McGeorge, Jr.

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Thomas pump is specifically designed so it can be made of Thomas Ni-Hard, one of the hardest and most abrasion-resistant alloys known. It far outlasts manganese steel, cast iron or other materials.

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Members of the Vermiculite Institute attending the 14th annual convention at Fort Lauderdale, Fla.

New Applications for Vermiculite

VERMICULITE INSTITUTE, Chicago, Ill., held its 14th annual convention April 2 through 7 at the Laga Mar Hotel, Fort Lauderdale, Fla. Dayton L. Prouty, Zonolite Co., Dearborn, Mich., was elected president, succeeding Lorne G. McDiarmaid, Insulation Industries, Ltd., Vancouver, B. C.

G. H. Wendel of Los Angeles and Charles Goyer of Montreal were named to the board of directors. Edward R. Murphy of Chicago was re-elected managing director, and W. J. Bein, Zonolite Co., Chicago, was re-elected treasurer.

This meeting had the largest attendance in the Institute's history — 80 members and guests. Among the guest speakers were Clair W. Ditchy, president of the American Institute of Architects; Stanley Smith, president, Concrete Construction Co., Columbia, S. C.; E. F. Venzie, president, National Bureau for Lathing and Plastering; and Theodore Riedeberg, New York City, who is consultant to the vermiculite industry in the agricultural uses of the mineral.

The convention devoted one day to discussions of concrete and another day to plaster and machine-applied concrete and plaster spandrel wall construction.

Stanley Smith described a new pump he developed which covers 1500 to 1800 sq. ft. per hour with a 2-in. thickness of vermiculite concrete. The cost of pumping the material is less than with other handling methods, the concrete screeds very well, and there is excellent yield control, Mr. Smith stated. His firm has been installing vermiculite concrete roof decks for the past two years. He predicted a bright future for insulating concrete roof decks.

Also of interest was the discussion of a pitched roof of vermiculite concrete installed on three Memphis homes, which was described by C. R. Babb, St. Louis, Mo. This installation saved 20¢ per sq. ft. compared with conventional roofs, Mr. Babb asserted.

The new First Security Building, Salt Lake City, Utah, was described by L. K. Irvine, Vermiculite-Intermountain, Inc. The first multi-story building erected in the area for 19 years, it is also one of the first to take advantage of the 5-hr. fire rating recently issued to machine-applied vermiculite concrete spandrel walls. The space-saving with this thinner type wall construction represents $16,000 in annual rentals for the owner, Mr. Irvine stated. Vermiculite will also be used to fireproof the steel frame and to provide acoustical treatment in the building.

Theodore Riedeberg described the role of vermiculite in agriculture as a carrier for insecticides and herbicides.

Dayton L. Prouty, new president of Vermiculite Institute

This is a brand new approach to the problem of pest control, in which the pest killers are drilled right into the soil. In some cases the insecticide or herbicide is actually mixed into the fertilizer-vermiculite combination before application. The best pest controls, he said, are waxy materials or sticky oils, which before presented an application problem. Now a farmer can handle this free flowing bagged material quickly and economically and get markedly increased yields.

E. F. Venzie asserted that lightweight aggregates offer tremendous possibilities to the plastering industry in finishes, sound-proofing, fireproofing, exterior lightweight walls, and many other ways now being developed.

In his discussion of the future of building construction, Clair W. Ditchy predicted that houses will be better and cost less. He said that marked improvement will come about through mass production.

Plans Gypsum Plant

NATIONAL GYPSUM CO., Buffalo, N. Y., has announced plans to build a gypsum wallboard and plaster plant at Westwego, La., costing $6,000,000, as part of the company's five-year, $75,000,000 expansion program. Gypsum for the plant will be shipped from deposits near Halifax, Nova Scotia.

Cement Wage Awards

CONTRACTS CALLING FOR WAGE INCREASES and broadened fringe benefits have been signed by 17 cement plants in Lehigh Valley, Penn., affecting about 6000 members of the United Cement, Lime & Gypsum Workers, A.F. of L. The new contracts call for wage increases of six to nine cents an hour.

Production and Value of Sand and Gravel in 1954

NATIONAL SAND AND GRAVEL ASSOCIATION has published the results of its second annual survey of the production and value of sand and gravel. Questionnaires were sent to the 1691 sand and gravel compaines in the United States and returns were received from 553 companies, operating 878 plants. The reporting companies in 1954 produced 186,844,448 tons, valued at $196,344,138 or an average value of $1.05 per ton. This compares to the 1953 survey in which 412 companies, operating 661 plants, reported a total production of 162,457,463 tons valued at $162,663,256 or an average value of $1.00 per ton.

The average production per reporting company was 337,874 tons as compared with 394,314 tons reported for 1953, and average production per plant in 1954 was 212,807 as compared with 245,775 tons for 1953. The reporting companies produced 84,164,624 tons of sand, valued at $80,995,278 (average of $.96 per ton) and 102,679,824 tons of gravel, valued at $115,348,860 (average value of $1.12 per ton).

Trucks continued to carry the greatest proportion of sand and gravel tonnage, accounting for 60.6 percent of the reported production as compared with 61.0 percent in 1953; railroads transported 25 percent or a decrease of 3.4 percent from 1953; and water transportation accounted for 11.5 percent of the reported production — an increase of 1.5 percent over 1953.

Heavy construction (industrial buildings, highways, streets, etc.) consumed slightly more than 40 percent of the reported total. The ready-mixed concrete industry was the second largest purchaser, using approximately 32 percent of the reported production. These two uses show one percent gain over 1953. Sizable quantities of sand and gravel were also used for concrete products (4.4 percent) and for railroad ballast (4.2 percent), and almost 14 percent was sold through dealers.

Concerning the distribution of sand and gravel production by company size, the largest number of companies were in two brackets—50,000-100,000 tons (in which were 19 percent of the companies responsible for 4 percent of the production) and 100,000-200,000 tons (21 percent of the companies responsible for 9 percent of the output.

Nine companies each produced more than 3,000,000 tons of sand and gravel last year, accounting for 21.5 percent of the production. Seven percent of the reporting companies produced almost 50 percent of the total.

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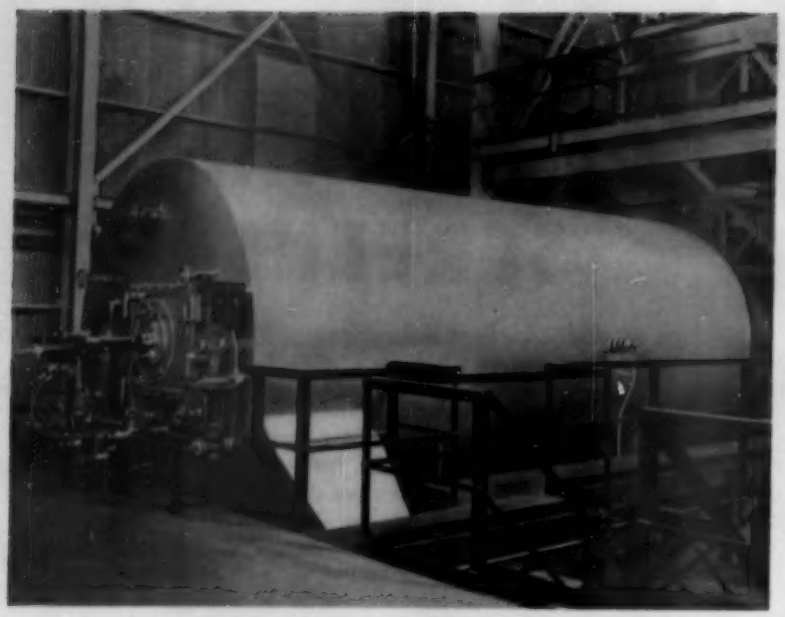

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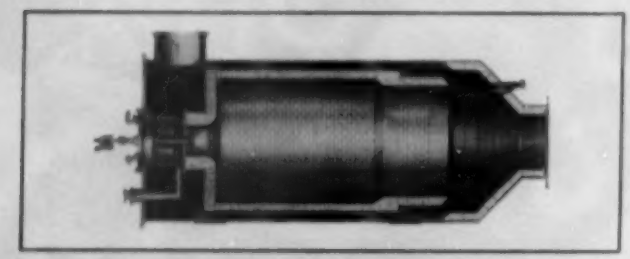

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Rocky's Notes

(Continued from page 75)

and concrete aggregates have not been studied from these angles with the emphasis on chemical structure and relative bond strengths.

Colloid Chemistry

The chapter on the "Colloid Chemistry of Soils" is also of equal interest to researchers in cement and concrete, since during the formation of concrete the cement colloids play a very important role, similar apparently to that of colloids in soils, except for different end products. It is the colloidal properties of both soils and cement that make possible the base exchange phenomena, which are covered in detail in the succeeding chapter on "Cation and Anion Exchange Phenomena." The particular ion exchange phenomena of current interest to cement and concrete researchers is that described in the paper by Powers and Steinour, already referred to—the exchange of calcium ions for sodium ions, and *vice versa*. In this book are mathematical formulas which are used to predict and estimate the extent of such exchanges. Briefly, as the work of Powers and Steinour shows, this depends partly on the relative concentrations of the two hydroxide solutions NaOH and $Ca(OH)_2$. This changes with external conditions, such as the degree of saturation of the material, the temperature, etc.

Ion exchange is important to an understanding of the functions of soil additives such as lime and phosphate, but that is a matter for researchers rather than for producers of these fertilizers. Nevertheless, producers who want some real understanding of how plants use the products they manufacture would profit by knowledge of this part of the book, but it is quite technical and not readily comprehended by the lay reader. The subject is not fully understood even by soil experts. A good summary, in the words of our author is: "Many experiments have evidenced that *there is no single universal order of the replacing power of cations.*" While a bivalent ion like calcium ordinarily replaces a monovalent ion like sodium, this doesn't hold under all conditions, as already pointed out.

Lime and Limestone

The day has gone when a producer sold agricultural lime or limestone simply as an "acid neutralizer." Acid soils are the exception rather than the rule, and liming does things to some soils that are not acid. First and foremost, perhaps, it supplies calcium, an essential plant nutrient. Also, the

A heaping load in the bucket of this 2¼-yd. MICHIGAN . . .

The bonus in the bucket pays for this machine fast!

Take another look at the bucket in the photograph. It shows a typical MICHIGAN* bucket-load, heaped-up well over the rated capacity of the bucket—nearly a 50% bonus. Translate this bonus into your daily production and you'll see why a MICHIGAN Tractor Shovel pays for itself fast: you simply move more material with a MICHIGAN.

Tremendous digging ability. Get the bucket blade into hard-to-dig material or under a heavy obstacle and "work" the bucket until you've got a heaping load. The two double acting bucket cylinders are actually powerful enough (if the blade is under an immovable object) to pull the back wheels off the ground! We'll match the MICHIGAN'S digging ability against any make or type of Tractor Shovel, bar none.

Low-level bucket action. You can roll the bucket back only a few inches off the ground—heaping bucket-loads even when the material is scattered only a few inches high. And you can carry the full load *low*—your driver can *see* where he's going, he doesn't have to travel *backwards*.

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The B-68 is rugged—stands up under hard, day after day usage . . . Moves over the road at 20 m.p.h. . . . Pays off in profits because no other machine can load as fast . . . Practical if you load only 1,000 tons per day yet *can handle 3 times that amount all day every day!* Check these features—no other loader can match them:

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New Nelson B-68

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amount of calcium available in the soil has very important effects on the amounts of other needed plant nutrients that can be taken up by plants—potassium, phosphorus, sulphur, etc. Too much lime is often as bad as too little; nor are the pH values of the soil the only criteria.

Benefits of liming soils are listed as follows: (1) Affects the solubility and availability of nutrient ions; (2) affects the solubility of toxic substances in the soil—renders aluminum and manganese less soluble; (3) influences the structural characteristics of the soil; (4) influences the distribution of roots in the soil—important because plants get their mineral nutrition through their root systems. Each of these reasons is expanded upon in the text and can furnish some mighty good sales arguments for the use of lime.

Labor Relations

(Continued from page 27)

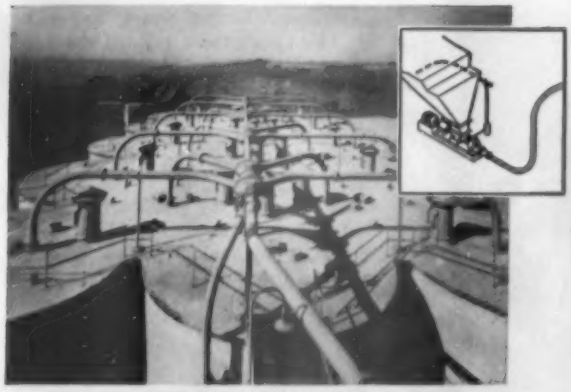
son of its failure to pay overtime wages, in the amount of $19,908.58. The Government, in its counterclaim, asks for a judgment against the plaintiff for that amount.

"The plaintiff has asked for a summary judgment dismissing the Government's counterclaim. It says that the counterclaim is barred by the Portal-to-Portal Act of 1947, 61 Stat. 87, 29 U.S.C. 255. Section 6 of that Act provides:

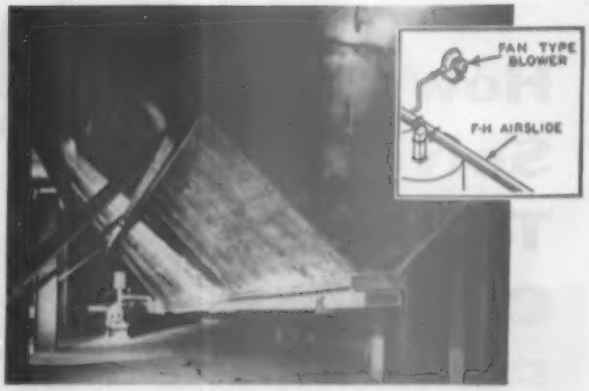
> Any action commenced on or after May 14, 1947, to enforce any cause of action for unpaid minimum wages, unpaid overtime compensation, or liquidated damages, under the Fair Labor Standards Act of 1938, as amended, the Walsh-Healey Act, or the Bacon-Davis Act—
>
> (a) if the cause of action accrues on or after May 14, 1947—may be commenced within two years after the cause of action accrued, and every such action shall be forever barred unless commenced within two years after the cause of action accrued;
>
> (b) if the cause of action accrued prior to May 14, 1947—may be commenced within whichever of the following periods is the shorter: (1) two years after the cause of action accrued, or (2) the period prescribed by the applicable State statute of limitations; and, except as provided in paragraph (c), every such action shall be forever barred unless commenced within the shorter of such periods;
>
> (c) if the cause of action accrued prior to May 14, 1947, the action shall not be barred by paragraph (b) if it is commenced within one hundred and twenty days after May 14, 1947 unless at the time commenced it is barred by an applicable State statute of limitations.

"The Walsh-Healey Act provides that 'any sums of money due to the United States of America by reason of any violation of any of the representations and stipulations' in the contracts named in that Act 'may be withheld from any amounts due on any such contracts' or 'may be recovered in suits brought in the name of the United States of America by the Attorney General thereof.'

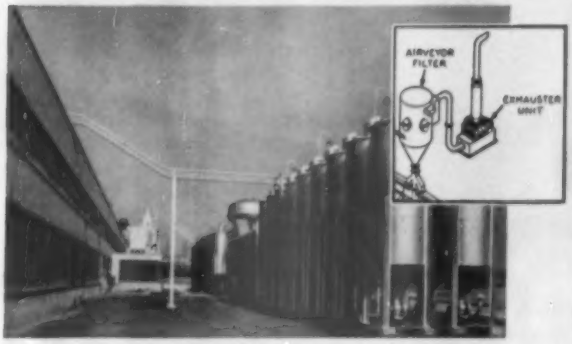
"The Government suggests that possibly the limitations prescribed by the Portal-to-Portal Act do not apply to suits based upon the Walsh-Healey Act. That question has been authoritatively decided in Unexcelled Chemi-



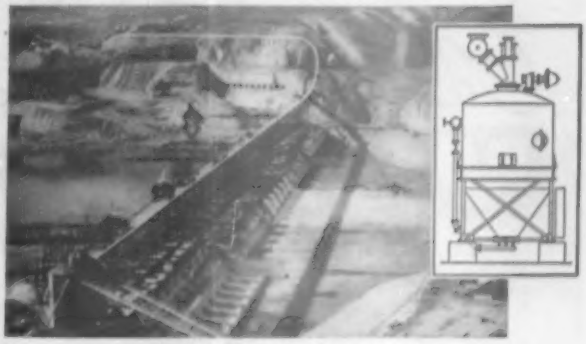
Fuller-Kinyon System



F-H Airslide



The Airveyor



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cal Corp. v. United States, 345 U.S. 59. The Court there regards the language of the Portal-to-Portal Act as too plain to permit of an interpretation such as the Government urged in that case and suggests in this. The Court held that the Government's cause of action arose at the time of the violation of the Walsh-Healey Act, and not at the time the Department of Labor initiated or concluded proceedings pursuant to the Act.

Conflicting Contentions

"If, in the instant situation, the Attorney General had, instead of filing the counterclaim in this court in 1954, filed a suit against the plaintiff in a United States District Court at that time, his suit would have been filed many years too late. The plaintiff says that the limitations in the Portal-to-Portal Act bar the Attorney General from filing a counterclaim in this court just as effectively as they bar him from filing an independent suit in a District Court.

"We think the plaintiff is right. The purpose of Congress in imposing the drastic limitations which it did impose in the Portal-to-Portal Act would be frustrated by exposing a contractor with the Government, apparently perpetually, to the risk of having a Walsh-Healey claim asserted against him if he ventured to assert any sort of claim against the Government, on any account, in this court.

"The Government says that by its counterclaim it is not really asking for an affirmative judgment against the plaintiff, but is only asking the amount of its counterclaim be allowed in reduction of the amount, if any, to which we may find that the plaintiff is entitled in its suit. This reshaping of a counterclaim, to give it the characteristics of a shield rather than those of a sword, seems not to be authorized by the statutes. Section 1503 of the Judicial Code says:

> The Court of Claims shall have jurisdiction to render judgment upon any set-off or demand by the United States against any plaintiff in such court.

"Congress apparently did not contemplate, in this section, a claim by the United States which might have enough validity to justify its use defensively, but not enough validity to justify its use as the basis for a judgment against a plaintiff.

Withholding Provision

"The Walsh-Healey Act in its Section 36, 41 U.S.C. 36, says in part:

> Any sums of money due to the United States of America by reason of any violation of any of the representations and stipulations of *said contract* set forth in section 35 of this title may be withheld from any amount due on *any such contracts* or may be recovered in suits brought in the name of the United States of America by the Attorney General thereof. (Italics added).

(Continued on page 96)

MEMO:

Here's how to get the capacity and flexibility to handle a wider variety of contracts

It's pretty hard to beat a Cedarapids Commander for high daily tonnage and economical performance . . . especially if your job requires big volumes of finer sizes, or if you're working a pit with a high percentage of fines. The Commander, with its big 30" x 25" roll crusher and large screen, was specifically designed to increase output on such jobs, yet it has proved highly versatile for handling a wide variety of conditions while hanging up production records of 200, 300 and 400 or more tons per hour!

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With a Cedarapids Portable Primary to handle the heavy crushing load ahead of your Commander, you can turn all the pit-run material . . . even big boulders . . . into specification product. You can re-open pits previously considered exhausted, open up new deposits that were considered unworkable because of oversize, or move into quarries close to your job. You'll have the capacity and flexibility to handle a wider range of profitable contracts.

And to step up production still more, be sure your Portable Primary is equipped with a Vibrating Grizzly. Located between the feeder and the crusher, it by-passes fines and undersize material before they reach the crusher. Wet, sticky material is easier to handle, output of the primary crusher is increased up to 25%, and maintenance costs per ton of finished product are reduced. With this set-up ahead of your Commander, you'll have a plant that can't be outproduced in any pit or quarry!

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"We have concluded above that a suit by the Attorney General would be barred by the limitations of the Portal to Portal Act, as would also a counterclaim based upon Section 1503 of the Judicial Code. But the problem of the applicability of the right to withhold, given to the Government by Section 36 of the Walsh-Healey Act, quoted above, remains.

"If the withholding right were applicable only to money due under the same contract in the performance of which the violation of the Walsh-Healey Act had occurred, we would have merely in instance of common-law recoupment, the stating of an account of how much each of the contracting parties owes the other on the contract, and the payment of the difference. Applied to the instant case that would mean that the Government could withhold, or use defensively in this suit, only what was due it, for the violation of the Walsh-Healey Act in the performance of the one contract on which the plaintiff is suing. Violations which occurred in the performance of the other sixteen contracts, which violations the Government, has included in its counterclaim, could not be the basis for withholding under Section 36.

"In our quotation of a part of Section 36 we have italicized some words. In the part quoted, and in the prior part of the section which we have not quoted, the word 'contract' is in the singular until we come to the provision for withholding. Then it says that the amount due for violation may be withheld 'from any amounts due on *any such contracts.*'

Limitations Not Applicable

"As we interpret it, the withholding provision of Section 36 becomes a statutory extension of the commonlaw doctrine of recoupment, extending the withholding right beyond the particular contract to other contracts of the same species. This interpretation requires us to consider again the possible applicability of the limitations of the Portal to Portal Act to the withholding right as thus interpreted. The Portal to Portal Act, as we have seen, applies to

> any action * * * to enforce any cause of action for unpaid minimum wages, unpaid overtime compensation, or liquidated damages,

under the named statutes. We conclude, somewhat doubtfully, that, just as the limitation would not have applied to a common-law withholding or recoupment of a claim arising out of the same contract, so it does not apply to the statutory withholding or recoupment authorized by Section 36. Such a withholding, used only as a shield, is not an 'action to enforce (a)

(Continued on page 98)

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cause of action' within the language of Portal to Portal Act. We think that Congress probably did not intend, by that Act, to discard the policy expressed in the Walsh-Healey Act.

"We will treat the defendant's 'counterclaim' as a defensive pleading, asserting merely the right to withhold the amount claimed from any amount to which the plaintiff may be found to be entitled for the breach of its contract.

"The plaintiff's motion will be denied.

"It is so ordered."

Calcining Reactions

(Continued from page 86)

from the total CaO. Instead of this ratio, we prefer to calculate the "lime deficiency," which is the amount by which the CaO content falls short of the technical lime limit. This may be found by substitution in the following equation, obtained by transposing terms in equation 19, as follows:

$$L.D. = 2.80\ SiO_2 + 1.18\ Al_2O_3 + 0.65\ Fe_2O_3 - CaO \quad (20)$$

in which L.D. represents the lime deficiency.

Since the plane represented by equation 19 passes through the C_2S and C_4AF points in the space model, an equation in terms of potential composition will not involve these compounds. The equation corresponding to equation 20 is as follows:

$$L.D. = 0.33\ C_2S - 0.18\ C_3A. \quad (21)$$

To avoid exceeding the technical lime limit, the lime deficiency calculated by substitution in equation 20 or 21 should be positive. The lime deficiency to be sought in plant operation will depend upon such conditions as fineness of the raw mix, thoroughness of mixing, and the degree of precision in composition control.

Equations 19-21 are subject to modification when required by future investigations of the quaternary system $CaO\text{-}Al_2O_3\text{-}SiO_2\text{-}Fe_2O_3$ and of systems involving additional components. However, they agree quite well with experience, and may serve a useful purpose until more precise relations are formulated.

This paper has been concerned with application of phase equilibrium data to the process of burning portland cement clinker. The phase diagram of the system $CaO\text{-}Al_2O_3\text{-}SiO_2$ involves only three of the oxides in portland cement. It nevertheless has been possible to learn from it some of the principles pertaining to the burning process. Further investigation of the quaternary system $CaO\text{-}Al_2O_3\text{-}SiO_2\text{-}Fe_2O_3$ will yield much more information. Because of the solid solu-

(Continued on page 100)

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American Cancer Society

Calcining Reactions

(Continued from page 98)

tion series C_3F-C_6A_2F discovered by Swayze[9] some details needed for mathematical treatment of that system must be obtained. This introduces difficulties in interpretation not found in the ternary system. The problems concerned with the process of burning cement clinker and with the constitution of portland cement are much more complex than were foreseen when Rankin and Wright investigated the ternary system.

It should be understood from the foregoing study that the changes in character and proportions of phases during the burning process play an important part in determining the character and proportions of phases in the cooled product; that is, the chemical constitution of a cement clinker of any given composition is governed by the treatment it undergoes in the burning and cooling operation. Reducing conditions occasionally exist in a cement kiln, but it will be assumed here that the time-temperature curve is the only governing factor. At clinkering temperatures the clinker is partially fused; that is, it contains liquid. It is sometimes thought that combination of the oxides to form compounds occurs at this stage, and that all that is necessary to secure "complete combination" is to maintain a sufficiently high temperature for a sufficiently long time. This is a misconception. If a given clinkering temperature is maintained until a state of equilibrium exists, one or more cement compounds will be absent, and a liquid will be present. There may be a tendency to assume that the absent compounds are in the liquid but this assumption is not sound. The atomic arrangement in the liquid is haphazard, so that the liquid can not be regarded as being composed of the cement compounds as such. In a paper on the constitution of glass, Morey[12] expresses the situation as follows: "The existence of certain compounds as the stable products of crystallization of a liquid is no evidence that they exist as such in the liquid, and no knowledge we have at present permits the identification of any compounds existing in the liquid state."

Following the burning operation, the clinker may be cooled so rapidly that crystallization cannot occur. The liquid then hardens to a glass. The glass, like the liquid, is not composed of cement compounds. The only sound reason for estimating the potential compound composition of glass in clinker is to determine the approximate quantity of each compound which is *not* present as a result of failure of the liquid to crystallize. The quantities of the compounds actually present may then be found by difference. It should be clear that the cooling operation plays an important part in fixing the chemical constitution of cement clinker. In fact, if a mixture of any given composition is maintained at a clinkering temperature until equilibrium is attained, the subsequent cooling operation governs the chemical constitution of the finished product.

It has been the purpose of this paper to use the phase diagram of the ternary system CaO-Al_2O_3-SiO_2 as a basis for demonstrating the manner in which a phase diagram may be applied in dealing with problems pertaining to the manufacture of portland cement, and to a study of the chemical constitution of the product. Chemists in direct contact with the manufacture of cement will find it helpful to become familiar with the subject.

Summary

Some of the principles pertaining to the interpretation of phase diagrams have been applied to the phase diagram of the system CaO-Al_2O_3-SiO_2, with the purpose of gaining an understanding of the clinkering operation. It has been found that:

1. In the process of fusion, liquid is formed at the expense of the solid phases present. The process may continue until one of the solid phases disappears. The percentage of that phase in the potential composition of the mixture governs the percent of liquid.

2. As the proportion of limestone in the raw mix is increased, a point is reached at which C_3S becomes the disappearing phase. The effect of increasing lime content in lowering the percent of liquid becomes very large, so that burning becomes increasingly difficult.

3. The "technical lime limit" is the maximum CaO content which may be maintained without encountering free CaO as an equilibrium phase. This technical, or practical, lime limit is expressed by the equation,

$$CaO = 2.80\ SiO_2 + 1.18\ Al_2O_3 + 0.65\ Fe_2O_3$$

4. When the technical lime limit is exceeded, the free lime present as an equilibrium phase is not removed by prolonged burning, or by increasing the temperature, but can disappear

(7) F. M. Lea and T. W. Parker, Phil. Trans. Royal Soc., 234, 731, 1 (1934).
(8) F. M. Lea and T. W. Parker, Bldg. Res. Tech. Paper No. 16 (1935).
(9) M. A. Swayze, Am. J. Sci., 244, 1; 65 (1946).
(10) W. C. Hansen, L. T. Brownmiller and R. H. Bogue, J. Am. Chem. Soc., 50, 396 (1928).
(11) Eberhard Spohn, Zement, 21, 702 (1932).
(12) George W. Morey, J. Am. Ceram. Soc., 17, 315-28 (1934).

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Construction of the Tournapull Rear-Dump has been radically simplified from that of a conventional heavy-duty hauler. In place of a foundation frame and body sub-frame, Tournapull Rear-Dump hitches rear and front wheels through a horizontal yoke extending back from the kingpin and pivoted to the body itself just above and ahead of the rear wheels. Body is simpler, much stronger . . . has no frame and sub-frame to get out of line.

Look at the photo above . . . note the absence of springs, spring hangars, and tie rods. Low-pressure tires adequately absorb the shocks of rough haul-road travel and high-speed loading. Eliminated are spring maintenance, replacement time and cost of spring parts.

Front wheel drive and kingpin-type steering help simplify Tournapull construction, too. No longer must power be carried back to the rear through a drive-shaft. Bearing and lubricating problems of a long drive-shaft are eliminated. No longer is steering handled by small front wheels subject to misalignment. There are no tie rods, no hinged steering connections to become twisted or bent.

Nor do you have the troubles of hydraulic hoists or gravity dumping with these Rear-Dumps. Dump is by an electric winch that lifts the body up on twin cables. Operation is under complete control at all times, with positive power for dump and return controlled by an electric switch on the dash. There are no oil seals, no high-pressure lines and jacks to keep tight, no freezing up in cold weather as with hydraulics. There are no shock loads as in gravity dumping. You save on regular maintenance time because there is no hoist mechanism to check . . . only a few places to lubricate.

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9 tons	22 tons	35 tons	50 tons
138 hp	208 hp	293 hp	420 hp

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only by extremely slow cooling.

5. The ideal state represented by the potential compound composition is attained only as a result of extremely slow cooling. If equilibrium is attained at a high temperature, the cooling operation determines the chemical nature of the product.

Rotary Kiln Segmentation

(Continued from page 64)

The chief trouble with the usual segments of today, called quadrants, is their inflexibility, their weak center joint and kiln ovalation. It seems that all of this could be taken care of, for the smaller shell diameters at least, as a large diameter is not necessary when the kiln is segmented.

In his effort to crystallize out the rotary kiln muddle, the writer emphasizes segments strongly as one of the required agents. No doubt due to imperfect translation, a German manufacturer assumed that it was my claim of their invention. An article appeared in their technical press, stating that it was they who first patented and made use of rotary kiln segments. The gist of this article was in turn translated into English and published in our press.

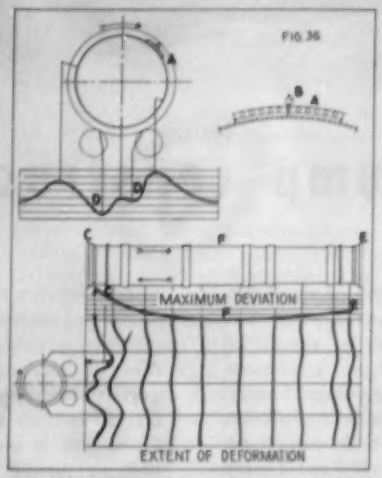

Fig. 36: System of measurement of elliptical deformation of kilns developed by Skanska Cement A/B

The German manufacturer no doubt has used segments and has patented them, but he was not the first to do this, in fact he was anticipated by 10 to 15 years. As to me, I only came to know about them accidentally, and certainly would not have had the temerity of claiming their invention as I have known that John J. Jones featured them in his U. S. patent, issued in 1911, and that Warner Co. installed them in 1915.

Our claim is only that we know where they should go, what they will do and why; which is something we have studied thoroughly.

Fig. 33 presents a series of sketches showing various segment arrangements. Of these, a few have been tried and are now in use, and others are only studies made by various individuals.

The first sketch in the upper row features the "Jones Tile" of 1911. The next two are variations of this tile system used today. As far as we know the first sketch of the second row represents the Didier Werke (German method of segmentation). It is quite possible that theirs is better than what we use at the present.

Fig. 34 shows how the tile break. Cracks occur in the tile, but being fitted in by tongue and groove joints they still hold. What is more serious is the imperfect fitting at the weak junction in the center. This and kiln ovalation causes movement and crumbling which increases the lengthwise movement, causing still more crumbling and failure. Then when one tile falls out, three more are lost and the adjacent tile lose their tongue and groove support. The matter has been given a great deal of thought by many; the other sketches in Fig. 33 prove this, and no doubt there are still others.

If the shell diameter were less and the shell stiffened, we believe that even these tile would give satisfactory runs. But what we would prefer is the method shown in Fig. 35, supplemented by stiffener bars and stiffener rings.

In the April, 1954 issue of the German publication, *"Zement-Kalk-Gips,"* there appeared an article by J. Rosenblad,† describing and discussing at length the new "Shelltest" method of measurement of kiln ovalation as developed by the technical department of the leading Swedish cement manufacturer, Skanska Cement A/B, Fig. 36.

†Also ROCK PRODUCTS, August, 1954, p.123

Spinning Rock Wool

(Continued from page 43)

and supervisor of operations at that plant until 1954.

President Mark P. Thomas has been in various industries including mineral wool at Temple, Texas. C. D. Richardson, nationally-known expert in mineral wool production of Muncie, Ind., and for whom the Richardson fiberizer is named, served many years in supervisory capacities in the industry, coast to coast, moved to Belton from Canton, Ohio, and had an active part in the plant building.

Directors, in addition to Messrs. Thomas and Doctorman, include J. Fred Patton (secretary-treasurer), Fred H. Guffy, Roy Sandeford, James W. Ward, Lloyd D. Hobbs and C. E. Laws.

3 shovels,

10 trucks,

23 stone stockpiles,

2 waste dumps...

1 tractor handles all cleanup

Too big for shovel to handle, these limestone chunks are dozed into worked-out sections of the pit. Four-wheel drive, 208 hp give tractor plenty of power to push up to 2½ cubic yards (5⅓ tons) per pass.

Tournatractor can switch up to 10 rail cars at once. Low-pressure tires do no damage to rails, ties, or paved surfaces. Supt. J. M. Christopher reports this unit requires "much less lubrication and considerably less maintenance than crawler-tractors formerly used."

For 100 years, the East St. Louis Stone Company and its predecessors have been quarrying limestone from a pit near Belleville, Illinois. For 100 years, they have dug in different directions, until, today, load areas are far apart and on levels varying from near-surface to over 225 ft. below surface. Three shovels and ten 11-ton trucks are now used to remove about 750,000 tons of stone yearly.

Suppose you were running this big job. Suppose you had to contend with its widely-scattered loading sites, its network of haul roads, and its steep grades. How many tractors would you ask for to do the "housekeeping" chores? How many to handle shovel cleanup? How many for haul road maintenance? Dump cleanup? Stockpiling? Emergency work?

East St. Louis Stone Company's Superintendent, J. M. Christopher, has what you'll probably agree is the most efficient answer possible. He is using *one tractor to do it all!* His choice is a high-speed rubber-tired Tournatractor.

Travels 1670 feet in 1 minute

This mobile unit "runs" from job to job at speeds to 19 mph. It dozes at speeds up to 8 mph. "We sure like its ability to go fast from one place to another," says Mr. Christopher. Its regular assignments, scattered 0.1 to 1.5 miles apart, include:

1. Cleans pit floor around all 3 shovels (1½, 2 and 2½ yds. in size). Works at each shovel two or three times per 8-hour shift. Besides ordinary cleanup, dozes over bank any rock chunks too big for shovel to handle. Typical 150 ft. to 200 ft. one-way push takes one minute . . . backup same distance takes half a minute.
2. Cleans shot stone after blasting at each of the 3 locations.
3. Moves large Joy drill around pit.
4. Levels and cleans around crushed stone stockpiles once or twice a day.
5. Levels waste dump once a day. Material mostly clay mixed with limestone. Tournatractor dozes up to 2½ cubic yards per pass.
6. Blades haul roads for the 10 trucks about once a day.
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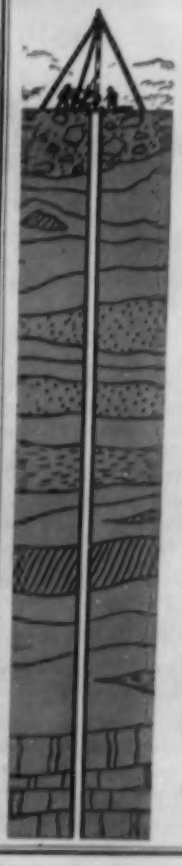

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Efficient Lime Hydration

(Continued from page 76)

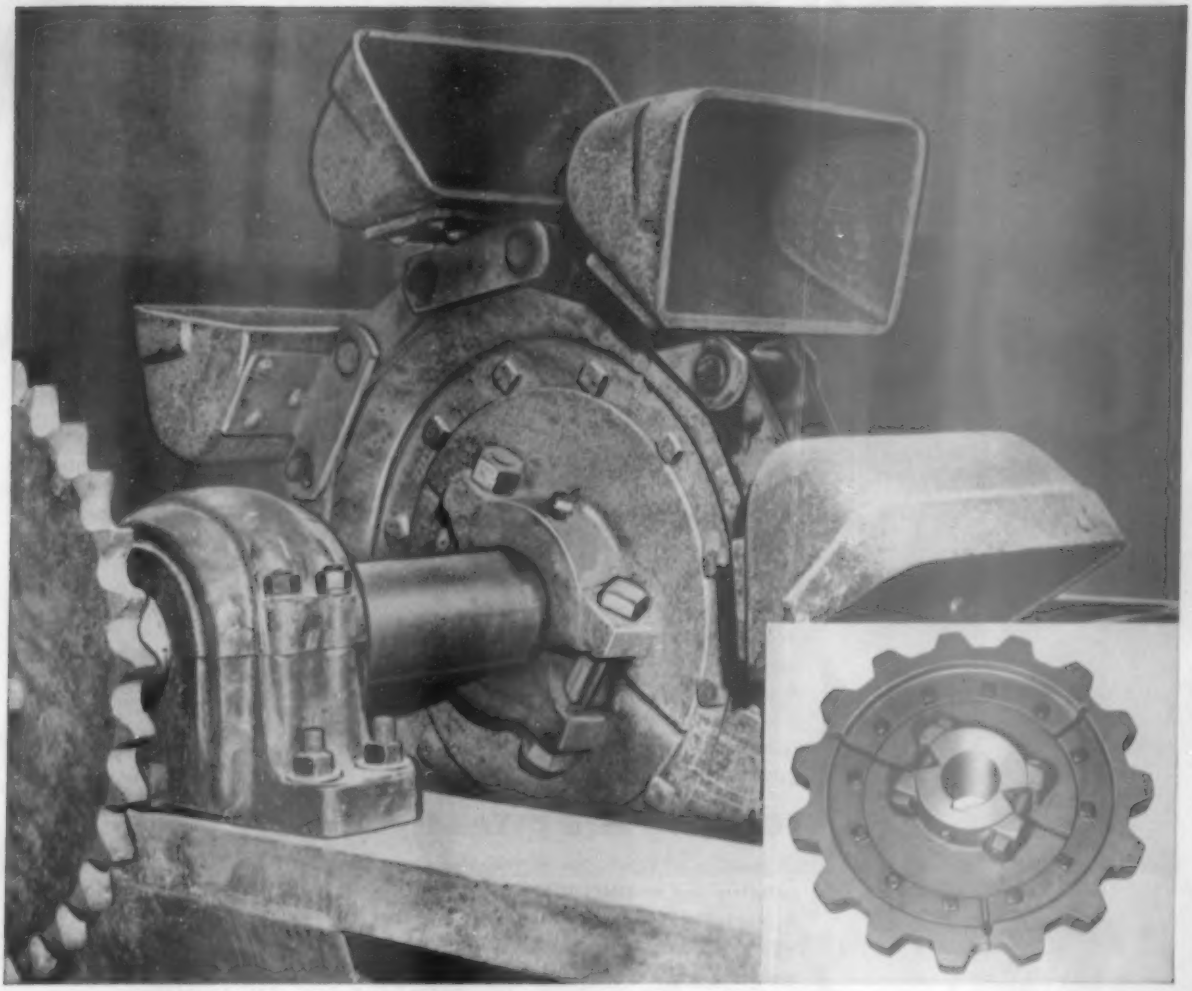
sure treatment of dolomitic lime to hydrate the magnesia was suggested by Charles and Irving Warner 40 years ago (U.S.P. 1,284,505). The process was used commercially to a limited extent for that purpose in Europe about 20 years ago. These batch processes are somewhat costly to operate, and although they are now so much improved that they are being employed competitively, the production of pressure hydrated dolomitic lime remained small until the successful introduction of the continuous process of Warner (U.S.P. 2,365,736) and the adaptation to continuous operation of the process by Corson.

Details of the pressure hydrators in use are still kept secret. In the batch processes, the methods of charging and discharging are of the greatest importance because it is there that much time can be lost. Depending on the lime to be hydrated and the pressure used the time required at full pressure may be from 10 to 60 min., and as high pressures are generally employed in batch plants the time is usually nearer the lower limit. Moreover the rise of pressure after the addition of water is rapid if the dolomitic lime is of the quality usual in America and the cycle time therefore depends very largely on the equipment and procedure for charging and discharging.

The main difficulty of continuous pressure hydration lies in the introduction of the quicklime under pressure, and it is here that there is scope for improvement over present practice, which in one instance involves heavy power consumption and wear and in another is limited in the type of lime that may successfully be handled.

As in the process of hydration at atmospheric pressure, the excess heat of reaction in pressure hydration is dissipated by the evaporation of water, and the excess steam generated is exhausted from both the batch and the continuous types. There is also a considerable quantity of steam occupying the free space in the hydrator at the end of the batch reaction and at least part of this is used to assist in the rapid discharge of the hydrate. In the continuous machine the excess steam is employed as a carrier for the hydrate, which is exhausted at high velocity through a relatively small orifice.

In all pressure hydrators the hydrate leaves the plant at a temperature corresponding to the pressure employed. If, for example, hydration is at 100 p.s.i. gauge pressure the hy-



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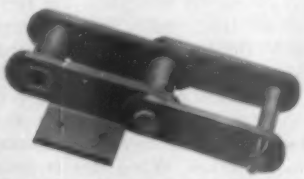

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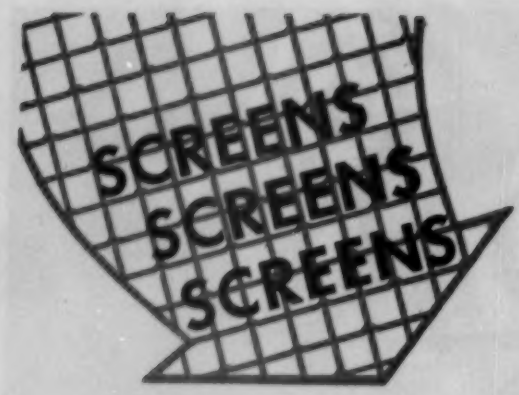

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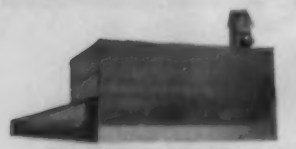

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drate is discharged at 338 deg. F. High temperature is undesirable in the subsequent handling of the product, and the usual practice is to discharge the hydrate wet so that the evaporation of the water on the release of the pressure will cool it. At 100 p.s.i. pressure the hydrate can be discharged with about 4½ percent of water, and dry itself in cooling to 212 deg. F. even in an atmosphere of pure steam. If air is allowed to mix with the released hydrate, thus reducing the partial pressure of water vapor, an even higher percentage of water may be evaporated, and the hydrate cooled to some lower temperature.

The ball-milling of dolomitic lime that has been hydrated under pressure has become almost universal practice in the industry, but it has been shown (Webb—*S. African Industrial Chemist*, Dec. 1952) that both the oxide and hydroxide of magnesia develop plasticity on ball-milling so that there is no logical reason to confine milling to pressure hydrate. That investigation showed two things: that the dolomitic hydrate made from lime burned at low temperatures does not expand in an autoclave test, although the magnesia is present as such, not as the hydroxide, and that this normal hydrate develops high plasticty on ball-milling. With the correct conditions of calcination, therefore, pressure hydration may be unnecessary, but it is doubtful whether any present method of calcination other than the fluidized bed kiln will produce lime at the right temperature with certainty.

Future of Hydration

The outstanding development in post-war years has been the production of magnesian hydrated lime under pressure which ensures the hydration of at least the greater part of the magnesia. These highly plastic hydrates, which attain plasticity immediately on mixing with water, are so excellent for mortar that they have stimulated the search for methods of producing the same results with high-calcium limes. The problem is part of the more general problem of making hydrated lime of the properties desired for any particular application, instead of merely accepting the form of hydrate that results from treating a lime by the hydration processes that have long been used. But the conditions of calcination influence so profoundly the hydration reaction that the two processes must be adapted one to the other. When this is done, and the reasons behind the great difference in properties are better understood, greatly improved qualities of hydrated lime will be produced.

One property of hydrated lime as

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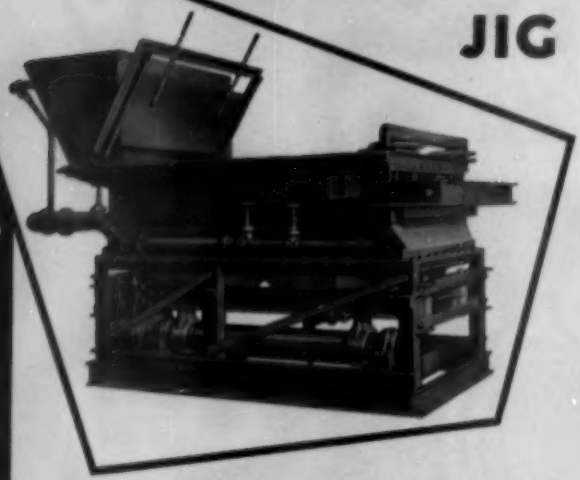

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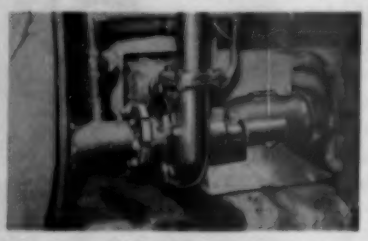

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ordinarily produced, which is apparent to everyone, is its lightness. Calcium hydroxide has a specific gravity of 2.3 but the bulk density seldom exceeds 0.5. For a given weight it requires large storage space, the sack size is large, and it is awkward to handle. Compare the above figures with those of a commodity such as sugar. Sugar has a specific gravity of 1.58 yet its bulk density is nearly 1.0. The advantage to producer and consumer of hydrate of much higher bulk density is considerable and such hydrate can be made, even with present knowledge.

Related to bulk density is the amount of water required to produce a putty of standard consistency. The smaller this is, the greater will be the strength of the mortar and the less the shrinkage. For the hydrate to be acceptable, the plasticity and sand-carrying capacity must also be satisfactory but these factors may, in fact, be high in a heavy hydrate of low water requirement.

The rate of settling of hydrated lime is, in itself, seldom of much importance, but the carbonate formed when milk of lime is used to causticize a soluble carbonate, in many of the chemical applications of lime, seems to assume the same particle form as the hydroxide, and to settle it about the same rate. For this reason a rapid-settling hydrated lime is often desired. It may be attained by an increase of particle size, but large hydrate particles tend to react slowly, which is undesirable. A state of subdivision sufficient for a high rate of reaction is not inconsistent with fairly rapid settling as long as the shape of the particles is favorable.

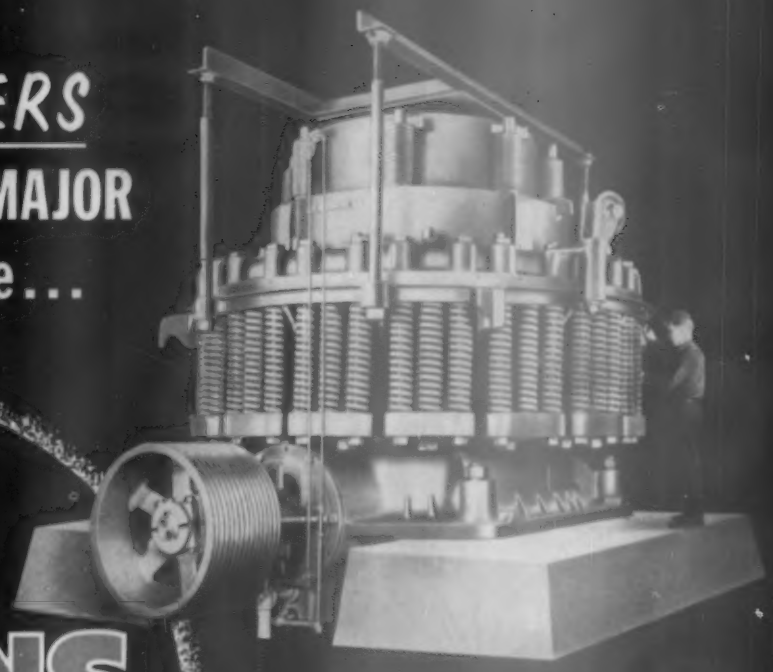
It is likely, therefore, that in the future the conditions of calcination combined with the method of hydration will be chosen to yield hydrated lime of the properties desired for its projected use. Whether hydration under pressure is employed will depend largely on developments in methods of calcination suited to the exact control and low temperature of calcination necessary for attaining the desired results by hydration without pressure.

Washington State Lists Producers

WASHINGTON DIVISION OF MINES AND GEOLOGY, Olympia, Wash., in its 1955 "Directory of Washington Mining Operations" (Information Circular No. 24), by Marshall T. Huntting, lists producers of both metallic and non-metallic minerals, including sand, gravel, riprap and crushed stone. Plants are listed alphabetically and indexed by property, product and county.

REPEAT ORDERS

from the WORLD'S MAJOR PRODUCERS prove...



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...here are a few good reasons:

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- UNIFORM CONTROLLED FEED
- MAXIMUM LINER UTILIZATION
- GREAT CAPACITY OF FINELY AND UNIFORMLY CRUSHED PRODUCT
- LOW COST—TROUBLE-FREE OPERATION

Symons Cone Crushers, *the machines that revolutionized crushing practice*, are built in Standard, Short Head and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to 900 tons per hour.

Proved in the profitable reduction of these and many more ores and minerals . . .

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- ABRASIVES
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- CHROMIUM
- COPPER
- FELDSPAR
- GOLD
- GRAVEL
- IRON ORE
- LEAD
- LIMESTONE
- MANGANESE
- MOLYBDENUM
- NICKEL
- SILVER
- SLAG
- STONE
- TACONITE
- TITANIUM
- TIN
- TUNGSTEN
- URANIUM
- VANADIUM
- ZINC

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DIESEL ENGINES

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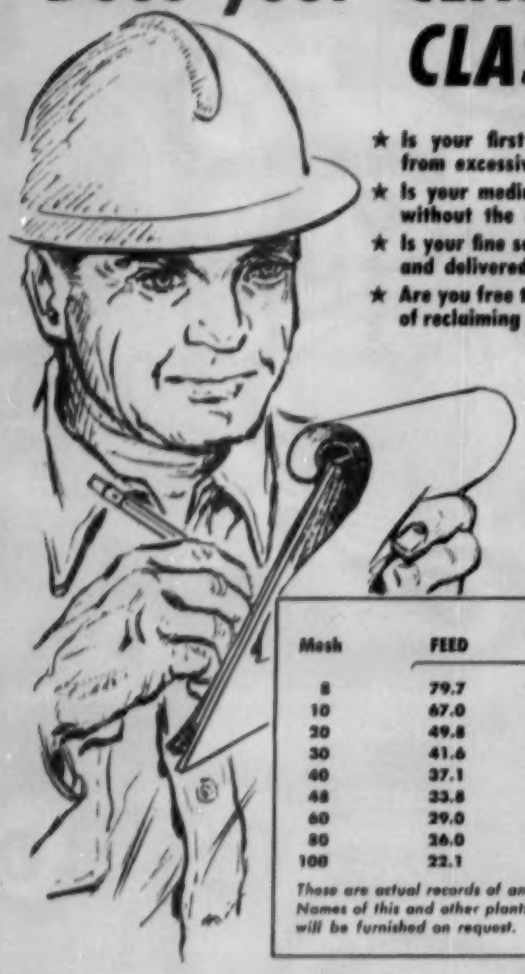
Does your "CLASSIFIER" CLASSIFY?



★ Is your first product (coarse sand) free from excessive fine sand?

★ Is your medium sand free of coarse sand without the extra step of screening?

★ Is your fine sand recovered from the water and delivered directly into your product?

★ Are you free therefore of the costly process of reclaiming your fines from a sludge pond?

Before answering the questions, compare your "Classifier" records with the following authenticated record of a 72" Auto-Vortex Cone Classifier handling 140 t.p.h. of crushed stone.

Mesh	FEED	OVERSIZE PRODUCT % passing	OVERFLOW PRODUCT
8	79.7	73.2	100.0
10	67.0	54.8	100.0
20	49.8	31.9	100.0
30	41.6	22.5	99.8
40	37.1	15.7	97.0
48	33.8	12.1	93.8
60	29.0	9.5	90.8
80	26.0	6.9	85.1
100	22.1	5.2	78.0

These are actual records of an Auto-Vortex plant in operation. Names of this and other plants with equally impressive records will be furnished on request.

Now, if your equipment does **not** deliver a like capacity to similar exacting gradation, and if your answer to any or all of the above questions is "NO," then your answer to the big question, "DOES YOUR 'CLASSIFIER' CLASSIFY?" must also be "NO."

If sand "classification" is your business, Auto-Vortex Classifiers truly live up to the name. They automatically "classify," and can change all your "NO" answers to "YES"!

This month 9 new Auto-Vortex Plants of various capacities will be in operation in the United States . . . either as original equipment, as replacement for existing equipment, or as auxiliary equipment to catch the fines lost by existing equipment. Operators of these new plants have selected Auto-Vortex Classifiers only after checking performance records and low operational costs of Auto-Vortex installations from coast to coast . . . plants which for over 25 years have been producing profitable gradations to the most exacting specifications.

Trade Mark Reg.

AUTO VORTEX CLASSIFIERS

are fully described in a Wood Company bulletin . . . yours for the asking. Also available are authentic records of plants with problems like yours, showing how A-V Classifiers can really "classify" . . . whatever the capacity or required specifications. Call or write us today!

CHARLES E. WOOD COMPANY

906 NORTH WATER ST. • MILWAUKEE 2, WISCONSIN

MANUFACTURERS NEWS

The Foxboro Co., Foxboro, Mass., announces the appointment of C. C. Fuller as vice-president, H. O. Ehrisman as general sales manager, and J. J. Burnett as field sales manager.

C. C. Fuller

H. O. Ehrisman

Mr. Ehrisman succeeds C. E. Sullivan, vice-president, who has retired after 45 years of service, but continues to serve in a consulting capacity. Also announced was the formation of a sales product development committee headed by Mr. Fuller, and a sales policy committee with Mr. Ehrisman as chairman.

Smith Engineering Works, Milwaukee, Wis., announces the appointment of Edward L. Horat as southeast district manager in North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi and Tennessee, with headquarters at Atlanta, Ga.

American Brake Shoe Co., New York, N. Y., announces that John S. Hutchins, has been named president of the Ramapo Ajax division in addition to his duties as president of the National bearing division. He succeeds Thomas W. Pettus, also a vice-president of American Brake Shoe, who has been assigned to overall railroad sales. Charles M. Ruprecht, president of electro-alloys division, has been named executive vice-president of the National bearing division. Paul L. McCulloch, Jr., sales manager of the electro-alloys division, succeeds Mr. Ruprecht as division president. Frederick T. Jordan has been made eastern district sales manager of the division.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces the election of Robert S. Stevenson as president to succeed the late William A. Roberts who died April 12. Mr. Stevenson has been executive vice-president since 1952. He started with the company in 1933 as a salesman in the tractor division at Kansas City, Mo. Two years later he was appointed assistant manager at Omaha, Neb., and in 1936 was transferred to the Milwaukee office. He was appointed assistant general sales manager for the tractor division in 1948 and general sales manager in 1950. He was appointed vice-president in charge of the tractor division in 1951 and later that year was elected to the board of directors. He has been executive vice-president since 1952.

Robert S. Stevenson

Smith Engineering Works, Milwaukee, Wis., has appointed W. F. Fuller Machinery Co., Ltd., Regina, Canada, as distributor for the Province of Saskatchewan, and Roy Klossner Co., San Antonio, Texas, in south Texas.

Willson Products, Inc., Reading, Penn., has been purchased by Ray-O-Vac Co., Madison, Wis. J. Clyde Ryan, executive vice-president of the Ray-O-Vac Co., has been elected president and general manager of Willson Products,

(Continued on page 116)

Pinellas Industries reported: **"5 belts sinewed for extra strength with Du Pont CORDURA have kept our complex conveyor system running efficiently"**

REG. U. S. PAT. OFF.

Pinellas Industries, Inc., has designed and built its plant around a system of 5 conveyor belts, all reinforced with Du Pont high tenacity rayon. These belts are stronger, yet thinner and more flexible—for better troughing and training.

NOW Du Pont SUPER CORDURA makes belts even stronger

REG. U. S. PAT. OFF.

The modern plant of Pinellas Industries, Inc., of St. Petersburg, Florida, was designed and built around a system of five conveyor belts. To insure maximum operating efficiency, all belts were reinforced with Du Pont "Cordura"* High Tenacity Rayon.

The belts carry sand, stone and crushed granite (1) from hopper cars up to a distribution structure, (2) along a shuttle conveyor to central stockpiles, (3) through a tunnel below grade, (4) up to batch bins for ready mix and blocks, and (5) to a fifth belt serving the pipe-plant batch bin. Manufactured by the Acme-Hamilton Rubber Co., the belts handle moist materials . . . operate in heavy showers and hot sun.

Now there's a new, stronger reinforcement available for conveyor belting—Du Pont "Super Cordura"† High Tenacity Rayon. "Super Cordura" has low stretch strength that permits belts that are stronger and more flexible. Downtime for take-up and resplicing is reduced to a minimum.

A product of Du Pont research, "Super Cordura" is 20% stronger than ordinary high tenacity rayon. You're assured of extra stretch resistance . . . extra flexibility . . . top performance under the most rugged conditions of use. Write us for the names of suppliers. E. I. du Pont de Nemours & Co. (Inc.), Textile Fibers Dept., Room 11506 Nemours Bldg., Wilmington 98, Delaware.

*Du Pont's registered trade-mark for its high tenacity rayon.
†Du Pont's registered trade-mark for its super-type high tenacity rayon.

Here are highly magnified cross sections of "Cordura" High Tenacity Rayon (left) and "Super Cordura" (right). "Super Cordura" is almost entirely composed of the tough "skin" that means even stronger yarn—greater impact resistance.

DU PONT *Super Cordura*
High Tenacity Rayon

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

THE *FORWARD* LOOK ...IN TRUCKS!

Dodge has changed the picture on performance, price!

Today there's a changed picture of truck power, payload, price! For example, do you know the answers to these 3 questions?

1—What trucks provide the highest horsepower of the 5 leading makes *in every conventional model*, ½-ton through 3½-ton?

2—What trucks have the highest payload in more models, 1½- through 4-ton, than any other leading make?

3—What trucks have the lowest factory retail price in more popular models than any other leading make?

In each case the answer is, "Dodge '*Job-Rated*' trucks" . . . the trucks with the Forward Look! Find out for yourself how Dodge trucks give you more visibility, more modern styling, more of everything you want in a truck. See your dependable Dodge Truck dealer now.

ALL-NEW

DODGE

"Job-Rated"

TRUCKS

PRODUCTS OF CHRYSLER CORPORATION

INFORMATION

TO HELP YOU MEET TODAY'S PROBLEMS AND TO MAKE PLANS FOR TOMORROW

You can obtain catalogs listed on these pages by merely checking and mailing the coupon below

1 **AIR CLASSIFIER**—Hardinge Co., Inc., has issued a four-page folder, Bulletin AH-467, describing the "Gyrotor" air classifier for separation of airborne mixtures of coarse and fine particles. The operating principle, and typical applications are discussed, and general arrangements and installations are illustrated.

2 **AIR-COOLED COMPRESSOR**—Ingersoll-Rand Co. has published a four-page bulletin, Form 1540, describing the Model 20T compressor equipped with the Ingersoll-Rand Channel Valve. Cutaway views and specifications are included.

3 **AUTOMATIC BAGGING SCALE**—Richardson Scale Co. has released Bulletin 3749A, describing and illustrating the E-50 automatic bagging scale. Line drawings illustrate suggested feeding arrangements, and specifications and optional features are outlined.

4 **BULK CONVEYORS**—Jarvis B. Webb Co. has issued a 12-page catalog, describing its bulk conveyors for handling coal, sand, gravel, aggregate, etc. Typical installation photographs and drawings of head and tail ends, cross sections, drives and takeup units are given.

5 **CLASSIFIER**—Dorr-Oliver Inc. has announced an eight-page bulletin entitled, "The FR DorrClone," describing and illustrating the historical development, physical characteristics, capacities and ranges of separation of the classification unit. Typical operating installations are illustrated, and line drawings of standard units are given.

6 **COMPRESSORS**—Pennsylvania Pump and Compressor Co. has released Bulletins 604 and 605, describing Pennsylvania Class ATCL and ATHL Oilfreair and Oilfregas compressors. Cutaway drawings are included.

7 **CONCRETE BATCHING—MIXING**—The C. S. Johnson Co. has prepared a reprint of a series of articles which appeared in "Construction Methods and Equipment." The reprint, "Concrete Batching and Mixing," gives data on portable and semi-portable on-the-job plants; single material and multiple batchers; weigh-beam and dial scales; scale adjustments and weighing tolerances; highway and airport concrete plants, etc.

8 **CONE CRUSHING PLANT**—Iowa Manufacturing Co. has issued Vol. 3 No. 1 of "In The Aggregate," featuring an article describing the Cedarapids Symons Cone Crusher Secondary, a portable cone crusher plant equipped for handling hard and abrasive rock or gravel.

9 **CRANE-CARRIER**—The "Quick-Way" Truck Shovel Co. has announced publication of a six-page bulletin describing and illustrating the construction and capacities of the "Quick-Way" ½-cu. yd. Model L-2. Features, digging ranges and ratings are listed and illustrated by means of charts, and specifications of the "Quick-Way" carrier are included.

10 **CRAWLER TRACTORS** — Caterpillar Tractor Co. has published a 104-page, heavily-illustrated, hardbound book, entitled "50 Years on Tracks," giving a series of separate, chronological essays on the history and advances of crawler tractors, beginning with combines and tractors which preceded the first crawler of 1904. The first three-fifths of the book covers Caterpillar history, and the remainder describes present manufacturing operations. The book is available at a cost of $1.25 from the company at Peoria, Ill.

11 **CYCLONE CLASSIFIER**—Dorr-Oliver Inc. has brought out Bulletin 2504, describing the physical characteristics, historical development, capacities, ranges of separation and operating results of the "M DorrClone" multiple cyclone classifier. Photographs of standard units are included.

12 **DIESEL LUBRICATION** — Caterpillar Tractor Co. has released Form 12440, entitled "Let Your Diesel Live," discussing the development of efficient lubricating oils, and how these oils affect the present or prospective owner of Caterpillar engines.

13 **DIESEL POWER UNIT**—International Harvester Co. has announced an eight-page booklet describing the UD-1091 diesel power unit. Specifications, photographs and performance charts are given, as well as descriptions of available attachments.

14 **DISPERSIONS**—Acheson Colloids Co., Div. of Acheson Industries, Inc., has announced a booklet entitled "A List of 'dag' Dispersions for Industry," listing 44 colloidal and semi-colloidal dispersions for operational functions, maintenance, lubrication, machine design, etc. Carriers and diluents are given for each product, along with typical applications and physical data.

15 **DRILL BITS**—Diamond Tool Research Co., Inc., has published a booklet covering Diamond drill bits for mining, grouting, concrete testing, blast holes, quarrying, etc. Specifications, price list, and advantages are included.

16 **DUMP BODIES**—Hercules Steel Products Corp. has brought out a catalog sheet giving detailed information on the HD Series heavy-duty excavator bodies. Specifications, illustrations, standard lengths, capacities, suggested hoist applications and construction details are given.

17 **DUST CONTROL**—American Wheelabrator and Equipment Corp. has brought out Bulletin 554-D, giving four case histories showing how cloth-filter-type dust collectors are used. Performance data is given in each case.

18 **ELECTRIC PLUGS**—Joy Manufacturing Co. announced publication of a 12-page bulletin, No. B59, illustrating and describing electrical plugs and receptacles for power connecting requirements. Standard styles and applications are given with specifications.

19 **ELECTRIC SHOVEL OPERATION** — Harnischfeger Corp., Electrical Application Division, has issued a 12-page reprint of a paper entitled, "Improving Electric Shovel Production Through Better Co-ordination of Operating Motions," by W. J. Cheroneis, chief engineer, Electrical Application Div. The paper compares adjustable voltage systems and P & H Magnetorque, electro-magnetic coupling. Several charts and schematic drawings are included, as well as a cutaway drawing of the electro-magnetic coupling.

20 **ELECTRODE**—Air Reduction Sales Co., Division of Air Reduction Co., Inc., has released a booklet entitled "Pocket Guide to Electrodes," describing and illustrating the Easyarc LH 7-16 electrode as well as Airco's complete electrode line.

21 **GASOLINE POWER UNIT**—International Harvester Co. has published an eight-page booklet, describing the U-154 power unit, a four-cylinder, valve-in-head gas or gasoline unit. Included are full specifications and performance charts, and descriptions of available attachments.

22 **GRATING AND TREADS**—Blaw-Knox Co., Grating Dept., Blaw-Knox Equipment Div., has issued Bulletin 2486, describing the types, sizes and load characteristics of the line of electroforged steel and interlocked aluminum grating and treads.

23 **HYDRAULIC PUMPS**—The New York Air Brake Co., Dudco Div., has published Bulletin DP-320, describing the series PFM-100 dual vane hydraulic pumps for mobile equipment. Selection data, flow rates and hp. input for four sizes at selected operating speeds are given. Photos and drawing illustrate the dual vane feature, cam ring design and other component parts.

24 **INDICATING-RECORDING INSTRUMENTS**—Barber-Colman Co., Wheelco Instruments Div., has released Bulletin F 5608-1, describing and illustrating its indicating and recording instruments for application on electrical variables and dc generators.

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25 **INDUSTRIAL TRUCKS**—Baker-Raulang Co. has published an eight-page bulletin, No. 54B, describing gasoline-powered, electric platform, electric crane and battery-powered fork trucks. Also included are the Gas-O-Matic and Baker Travelonder trucks. Included are tables of dimensions, capacities, weight, lift height and other specifications for each model, series, and type. Descriptions of special features are also given.

26 **JAW CRUSHER**—Lippmann Engineering Works has released Bulletin 1111, on the Rock-Ram overhead eccentric jaw crusher. Photographs, cut-away drawings, dimension tables, and specifications are given.

27 **LOADER**—Pettibone Mulliken Corp. has released a 16-page brochure, describing the "Cary-Lift" all-purpose loader. Typical application photographs, operating and construction features, specifications, accessory equipment and advantages are given for four different models—Fork, Swivel Clam, Sling and Super Sling.

28 **LUBRICATION**—The Texas Co. has published Vol. XLI, No. 5 of "Lubrication," featuring an article entitled "Progress in The Application of Industrial Lubricants." Twenty-nine figures illustrate the article.

29 **MATERIALS HANDLING EQUIPMENT**—Syntron Co. has released a 50-page catalog, No. 554, containing technical data, descriptions, and photographs of vibratory equipment, feeders, conveyors, power tools, shaft seals, diesel pile hammers, gasoline hammers, selenium rectifiers and other materials handling equipment.

30 **METAL GRATING**—Klemp Metal Grating Corp. has released a 16-page Data and Specification Manual covering grating, open steel floor armor, stair treads, vessel liners, bridge decking and drain grates. Load and dimension tables are also included.

31 **MOBILE TESTING LABORATORY**—Denver Equipment Co. has released Bulletin LG3-B11, giving data, illustrations and a scale drawing of the Denver mobile ore testing laboratory. Also included are illustrations and a diagram of Denver truck mills engineered to handle flotation, gravity concentration, cyanidation and heavy media separation under field conditions.

32 **ORE AGGLOMERATION**—Koppers Co., Inc., Engineering and Construction Div., has published a 24-page brochure, No. E-52, covering the entire field of ore agglomeration. Illustrations, detailed descriptions, fundamental characteristics of processes and technical information are given. Double-page charts give the flow diagram of a sintering plant as well as the mechanical features of the American Ore Reclamation Sintering Machine.

33 **OXYGEN ANALYZER**—Arnold O. Beckman, Inc. has published Bulletin 114, describing the Model C and Model C2P oxygen analyzers for continuously-flowing gas samples or fixed volume samples.

34 **PHYSICAL TESTING MACHINES**—Riehle Testing Machines Div., American Machine and Metals, Inc., has issued an eight-page bulletin describing the Riehle line of physical testing machines and instruments. Included is information on the Riehle creep testing machine and the lightweight portable hardness testers.

35 **PLATFORM TRUCKS**—Erickson Power Lift Trucks, Inc., has released literature describing and illustrating its platform trucks, Models P-5 and P-7, giving design and operating specifications, and an engineering drawing.

36 **PORTABLE POTENTIOMETER**—Barber-Colman Co., Wheelco Instruments Div., has issued Bulletin F 5760-1, describing and illustrating the Wheelco portable potentiometer. Standard and special ranges are given, as well as specifications and features.

37 **PUMPS**—Allis-Chalmers Manufacturing Co. has released Bulletin 52B6083C, entitled "Model C-3 'Electrifugal' Pumps," describing the Model C-3 supporting adapter "Electrifugal" pumps in capacities to 2500 g.p.m. Alternate sealing arrangements are described, and dimension tables are given.

38 **PUMPS AND COMPRESSORS**—Pennsylvania Pump and Compressor Co. has announced Bulletin 603, describing and illustrating its line of air and gas compressors, dry vacuum pumps, check valves, aftercoolers, and centrifugal pumps for handling water and aqueous solutions including boiler feeding.

39 **RUBBER GOODS—SHEET PACKING**—Hewitt-Robins, Inc. has published a catalog of molded rubber goods and industrial sheet packing. A specification chart compares the qualities of six types of natural and synthetic rubber, and hardness, tensile strength, elongation, approximate weight and standard width of each item are given.

40 **SCREENING**—Nordberg Manufacturing Co. has announced Bulletin 243, describing and illustrating the Symons V-Screen for fine screening, sizing, dewatering, dedusting, cleaning and washing. Dimensions, operational data, and construction details are given.

41 **SIPOREX**—The International Siporex Co., Ltd., has published a full-color brochure describing the use of Siporex slabs, beams and block, giving characteristics, and recommended applications. Typical installations are shown in full color photographs.

42 **TRACTOR SHOVELS**—Clark Equipment Co., Construction Machinery Division, has issued Bulletin 1250-P, describing and illustrating the "Michigan" Model 175-A, 2¼-cu. yd. rubber-tired tractor shovel, and the 1½-cu. yd. Model 125-A. Design, construction and operation data are given.

43 **TWO-STAGE COMPRESSOR**—Allis-Chalmers Manufacturing Co. has released a bulletin, No. 16B8244, describing two-stage, "Ro-Flo" sliding vane compressors. Included are a rating table, table of outline dimensions, and a cut-away drawing.

44 **TRACTORS**—Caterpillar Tractor Co. has published Form No. DE509, entitled "Low Cost Producers," describing four-wheeled tractors equipped with scrapers and wagons on a variety of jobs and operating conditions. Case histories are also given.

45 **VERMICULITE ACOUSTICAL PLASTIC**—Vermiculite Institute has issued a booklet entitled, "The Silent Treatment," covering vermiculite acoustical plastic and its application. Included are a table of physical data, standard specifications, and sketches of two constructions granted four hour fire ratings.

46 **VIBRATOR**—Master Vibrator Co. has issued a folder, No. MV 1162, describing the "1-Man" vibrator which operates from 115 volt ac or dc outlet or portable generator. Included are a comparison chart, models, specifications and drawings.

47 **WALKING DRAGLINES**—Page Engineering Co. has prepared Catalog WD&D-155, covering the line of single deck walking draglines ranging in size from 5 to 15 cu. yd. capacity. Specifications, typical application photographs and dimensional drawing are included.

48 **WASHING-CLASSIFYING EQUIPMENT**—Eagle Iron Works has published a 44-page catalog, No. 55, describing the entire line of washing-classifying equipment. Included are 45 views of recent installations, specifications, general installation dimensions, and line drawings.

49 **WELDING PUBLICATIONS**—Air Reduction Sales Co. has issued a 16-page Publication List, describing over 100 welding and cutting technical reprints, text books, safety booklets, slidefilms and movies. Order cards are included.

50 **WIRE REINFORCED CONCRETE**—Wire Reinforcement Institute, Inc., has published a booklet entitled, "Reinforced With Welded Wire Fabric." The illustrated booklet gives data on the use of wire reinforcing for driveways, sidewalks, patios, garage floors, foundation slabs, porches, basements, and swimming pools.

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is the standard "Lime Mill" of industry for producing all grades of hydrated lime, ranging from superfine chemical hydrate and spray lime to mason's and agricultural hydrate.

This one machine handles the complete operation: disintegrating, classifying and conveying the finished lime, as well as automatically rejecting impurities.

Whizzer air separation provides easy and close control of the product. Changing from one grade to another is made by one simple adjustment. You are assured of a consistently uniform hydrate and greatly increased capacity—plus the advantage of unusually low cost operation and maintenance.

Write for further details and applications of the Raymond Automatic Pulverizer.

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Raymond Division

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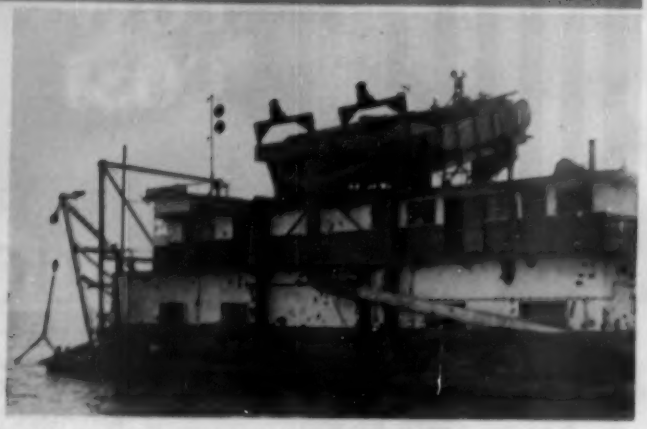
AKINS Classifiers washing oyster shell for cement



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Clean, high grade deposits of oyster shell are badly depleted and shell producers require washing equipment for processing low grade shell which is contaminated with mud and slime. Akins Classifiers have been their choice because they produce a cleaner product, handle large tonnage at low cost.

Akins Classifiers designed for oyster shell washing may be equipped with special scrubbing devices if additional washing action is required. The Akins Spray Water Box also may be added for difficult washing problems.

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KEEP ABREAST WITH INDUSTRY TRENDS THROUGH ROCK PRODUCTS

Inc., succeeding Thomas A. Willson who has been named chairman of the board upon the retirement of Dr. Frederick Willson. William C. Weeks, formerly sales manager, distributor division of Ray-O-Vac, was appointed vice-president in charge of sales, and Thomas A. Willson, Jr., vice-president in charge of production.

Cummins Engine Co., Inc., Columbus, Ind., has appointed E. D. Tull as executive vice-president according to an announcement by

R. E. Huthsteiner, left, congratulates E. D. Tull, R. B. Stoner, C. R. Boll and P. J. Every on their recent promotions

R. E. Huthsteiner, president. R. B. Stoner has been named vice-president of personnel; C. R. Boll, vice-president of sales; and P. J. Every, general sales manager.

The Thew Shovel Co., Lorain, Ohio, has announced acquisition of the plant and inventory of the Byers Machine Co., Ravenna, Ohio, for a little more than $900,000. A new subsidiary corporation, Byers Machine, Inc., has been formed to operate the plant in Ravenna headed by A. C. Lundgren as president and W. W. Blauvelt, general manager. Other officers are E. C. Brekelbaum and W. V. Clark, vice-presidents; R. W. Gleason, secretary; and Brooks McCracken, assistant secretary.

Bailey Meter Co., Cleveland, Ohio, announces that Paul S. Dickey, a director and formerly vice-president, has been elected president to succeed Robert S. Coffin, who has been elected chairman of the executive committee and named management consultant. Harvey E. Gorrie, chief engineer, has been appointed vice-president of engineering; Raymond D. Junkins, vice-president and director; and H. M. Hammond continues as a director and vice-president of sales.

Pennsylvania Crusher Division, Bath Iron Works Corp., West Chester, Penn., has announced the appointment of Harry J. Douglas as manager of the division, succeeding John A. Plimpton who has resigned to accept the position of vice-president in charge of the new crusher engineering division of Poor & Co. Lyle T. Johnston, formerly sales representative and advertising manager, has been made sales manager.

Hudson Pulp & Paper Corp., New York, N. Y., announced the appointment of William Mazer as president to succeed Jacob Mazer, who has been named chairman of the board. Irwin A. Zuckerman has been promoted from sales manager to vice-president in charge of the consumer products division; and Raymond S. Hatch, formerly director of research, has been made vice-president in charge of research.

Poor & Co., Chicago, Ill., has announced the appointment of John Plimpton as vice-president in charge of the new crusher engineering division in Philadelphia, Penn. He was formerly with the Pennsylvania crusher division of Bath Iron Works, as was F. H. Neely, who has been named chief design engineer of the division.

The Raymond Corp., Greene, N. Y., announces the election of George G. Raymond, Jr., as president to succeed his father, George

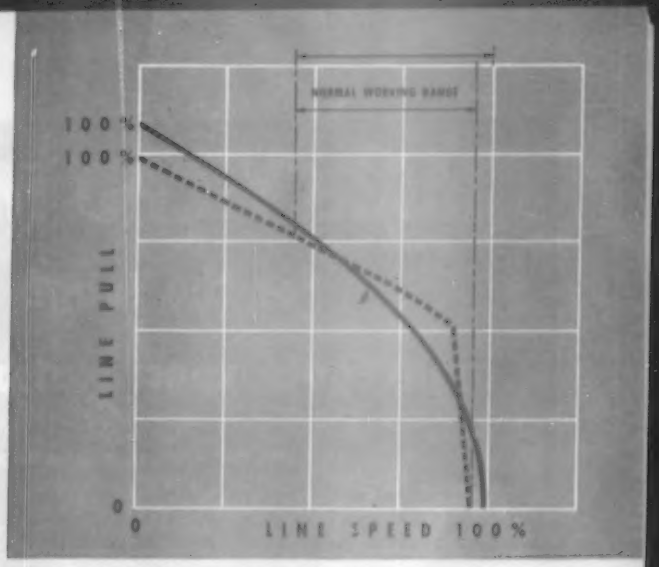
LIMA'S new Electric Power Unit eliminates stalls, won't burn out

LIMA's new optional power unit matches, *electrically*, diesel-torque converter performance. It combines an AC motor with a single stage torque converter to adapt actual power output to work load demand—at constant motor speed. Thus, you get power on demand through a wide operating range . . . and the motor will not stall or burn out in heavy load operation.

Just check the performance curves —— They make it clear that LIMA's new electric power unit is the perfect answer when your job calls for electrically powered machines. The new unit is available on every LIMA machine. It will pay you to get the full story today from your nearby LIMA distributor . . . or write: Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

CAPACITIES

Shovels to 6 yds.
Cranes to 110 tons.
Crawler, wheel or truck mounting available on smaller sizes.

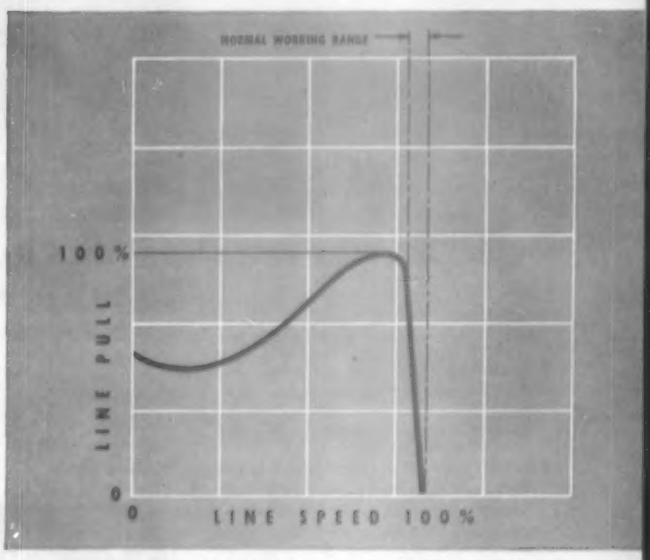


Power Performance of LIMA'S New Optional Unit:

A.C. Electric motor with torque converter drive [Diesel-torque converter curve (dotted line) shown for comparison]

With this drive, even under extreme loading, the motor will pull down in speed only a very small amount. It can never be stalled.

The line pull will constantly increase through a long pull down speed range, depending upon the load applied.



Power Performance: A.C. Electric motor with direct drive

The motor speed and torque varies as shown for line speed and pull.

With a pull down in speed of only 3% to 5%, torque rises too fast. The motor will stall quickly after peak torque is reached. Workable speed range is small, stalls are frequent.

BALDWIN BLH LIMA-HAMILTON

LIMA SHOVELS · CRANES DRAGLINES · PULLSHOVELS

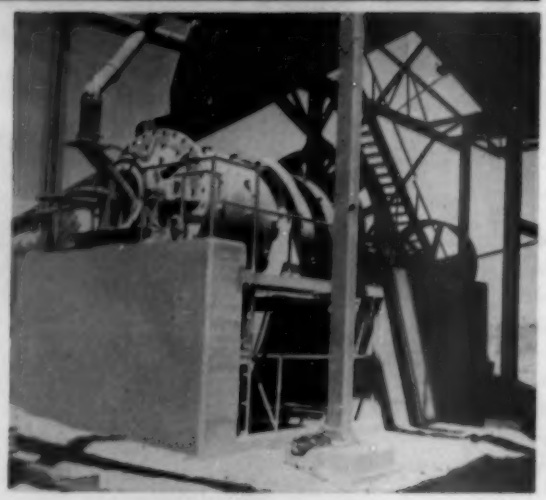
BALDWIN-LIMA-HAMILTON

Construction Equipment Division · LIMA · OHIO · U. S. A.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

MARCY CPD Mills

for the *tough* aggregate specification jobs



L. G. Everist, Inc., is supplying the aggregate for the Oahe Dam in South Dakota. This 6'x 10' Marcy* Center Peripheral Discharge Rod Mill is used in the sand circuit to improve gradation. This company has used Marcys for years; also has an 8'x 12' Marcy CPD Mill.

YOU GET ALL THESE ADVANTAGES WITH MARCY CPD MILLS

- **low cost** . . . maintenance is low—overall cost of mill operation, exclusive of amortization, is generally less than 25c per ton.
- **flexibility** . . . by varying rate of feed, pulp dilution and discharge port area it is possible to change gradation of finished product to meet different specifications.
- **better product** . . . feed enters both ends, discharges at center. Material moves rapidly through mill, and cubical shaped particles are produced with a minimum of fines.
- **wet or dry grinding**
- **capacities from 2 to 200 dry tons per hour.**

*Both Marcy and Massco are registered trademarks.

The Mine & Smelter Supply Co.
DENVER 17, COLORADO

G. Raymond, Sr., president for the last 33 years, who has been named chairman of the board. Mr. Raymond, Jr., was formerly executive vice-president and sales manager.

Marion Power Shovel Co., Marion, Ohio, has announced the appointment of Robert Campello as sales manager in charge of sales of all Marion machines sold through distributors in the United States and Canada. A veteran in the power shovel industry, Mr. Campello was associated with Bucyrus-Erie Co., South Milwaukee, Wis., for 17 years prior to joining Marion. Previously he was with the Tractor and Equipment Co. and the H. O. Penn Machinery Co. Born in New York City, Mr. Campello attended the Lafayette College, Easton, Penn., where he majored in economics and business administration.

Robert Campello

International Harvester Co., Chicago, Ill., has announced the appointment of W. F. Hall as manager of the industrial power division. He was formerly assistant central regional sales manager of the division and replaces L. A. Coomer, who has been transfered to the eastern sales region in another capacity. Walter H. Tudor has been appointed industrial power territory manager of the Chicago area, which includes all of Wisconsin and the northern two-thirds of Illinois.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has appointed Charles H. Hallett as assistant manager of sales at the Chicago plant. Since 1948 he has been head of the sales department at the Los Angeles steel service plant.

Chase Bag Co., Chicago, Ill., announces that R. N. Conners, executive vice-president, has been elected president of the Textile Bag Manufacturers Association.

Koehring Co., Milwaukee, Wis., announces that Foster-Bell Co., Sioux Falls, S. D., succeeds the Sioux Road Equipment Co., as distributor for the state of South Dakota.

Raymond Bag Co., Middletown, Ohio, has announced the appointment of Ward F. Sparkman as southeastern district representative in the states of Alabama, Georgia, Florida and Tennessee.

The Babcock & Wilcox Co., New York, N. Y., announces that L. S. Wilcoxson, vice-president in charge of research since 1945, has been appointed vice-president in charge of the boiler division.

General Electric Co., Detroit, Mich., has appointed the B-H Tool & Supply Co., Detroit, Mich., as distributor for the carboloy department.

ROCK WOOL ENGINEERING & EQUIPMENT CO.

★ Pioneers in the design and engineering of efficient, economical plants and equipment for the production of rock wool . . . complete engineering and manufacturing facilities available.

★ Our equipment can be found in the most successful plants in the USA, including the modern new facilities of Texas Rock Wool, Inc., at Belton, Texas.

If you are now operating a rock wool plant, or plan to enter the field, call on us for expert advice and assistance

ROCK WOOL ENGINEERING & EQUIPMENT CO., Wabash, Ind.

"CROSS" PERFORATED STEEL

SEGMENTS, SECTIONS, DECKS AND PARTS

for VIBRATING REVOLVING SHAKING

AND OTHER TYPES OF MACHINERY EQUIPMENT AND FACILITIES

ROUND OPENINGS — *for Uniform Sizing*

SQUARE OPENINGS — *for Intermediate Capacity*

CROSS HEXCREEN — *for Uniform Sizing & Maximum Capacity*

CROSS

Special Analysis Steels

Plus ● CROSS *Engineering*

● CROSS *Workmanship*

equals maximum production at MINIMUM COST!

The Sign of PLUS QUALITY

C+

for PLUS PERFORMANCE

CROSS ENGINEERING COMPANY

Manufacturers ● Carbondale, Pennsylvania ● Telephone: 300

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designers and builders of equipment for basic industries

IMMEDIATE DELIVERY

America's Superior Dryer

Now you can make fine coal drying a profitable operation with the new McNally "Dryclone". Tested and proven in the field the "Dryclone" can be operated for a few cents per ton and give a product with a delivered surface moisture as low as 5% depending upon sieve analysis and feed rate of coal to be dried.

For Basic Industries McNally Pittsburg offers:

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Kilns	

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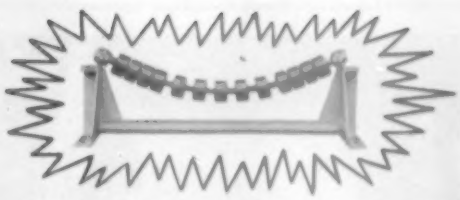
● PLANTS ●

Pittsburg, Kansas — Wellston, Ohio



Where There's ABRASION *or* CORROSION

. . . This JOY IDLER OUTLASTS THEM ALL!

SHAPES TO THE LOAD . . . CUSHIONS, GUIDES BELT

The unique Joy *Limberoller* Conveyor Idler consists of neoprene discs molded on flexible steel cable. It's suspended from two bearings—one at either end, *up out of the dirt zone.* Illustrated is an installation in a dusty coke plant. In another typical job, handling abrasive foundry sand, Joy units have lasted *10 times longer* than any previous idlers and are still going strong.

Conveyor efficiency is assured and maintenance is a breeze when you switch to these Joy idlers. They exert a cushioned grip that supports the loaded belt without slipping, and keeps belt wear to a minimum. They're easier, faster and less costly to install, maintain, knock down and move than any other conveyor idler on the market, and are available for belt widths of 18", 24", 30" and 36". ● Get the details! ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

OTHER ADVANTAGES:

• Resists corrosion, abrasion, flame, grease • Weighs ⅓ less than steel idler • Handles both bulk and packaged materials • Easily changed without stopping belt • Compactly stored • Saves handling time

WAD 1-9616

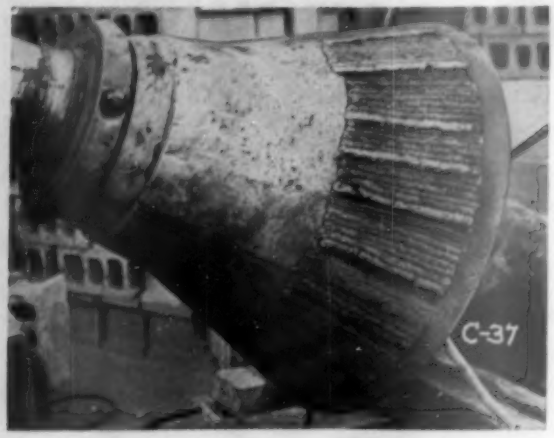
Ask for

FREE BULLETIN LD-103A WHICH GIVES COMPLETE DETAILS ON THE UNIQUE JOY LIMBEROLLER

JOY

A Leader Since 1851

LIMBEROLLER



Before and After Applying MANGA-TONE N. M. and RESISTO-LOY

This rebuilding job on Gyratory Liners was accomplished economically despite the fact that well over an inch of deposited metal was required all around the bottom third. Note the very badly worn areas in the "before" picture. Then note the perfectly done, finished job.

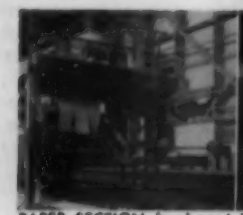
This rebuilding was done by the plant maintenance welder, using our Manga-tone N.M. to rebuild the liner and making the last pass over the lower 15 inches with Resisto-Loy. This final coating pays a fine dividend in additional wear resistance.

Why not put in a call for our field man? He can show you many ways to save materials and money.

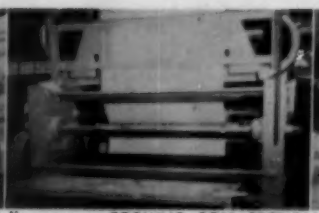
RESISTO-LOY CO., INC. - Grand Rapids 7, Michigan

EHRSAM gypsum and wallboard processing machinery

...WILL MODERNIZE YOUR PLANT FOR GREATER EFFICIENCY AND BETTER PRODUCTS



PAPER SECTION for board line paper is fed to board line with proper tension — giving a smooth surface to finished product.



FORMING ROLL SECTION — precision rolls run on anti-friction bearings — giving board a uniform thickness throughout.

MATERIAL STORAGE AND FEED — stucco bins with drag feeders store and transfer sufficient material for constant operation.

Ehrsam Lathe punch, can be furnished in Reciprocating or Rotary style with board speeds up to 300 ft. per min.

Ehrsam Calcining Kettle to reduce the raw gypsum to workable condition. Several sizes are available in gas or oil fired.

Ehrsam equipment will enable you to get the greatest returns from your plant by cutting maintenance and operating cost. Remember, if you are thinking of one machine or a complete plant, our staff of Engineers is available to you.

The J. B. EHRSAM & Sons Mfg. Co.
ENTERPRISE, KANSAS

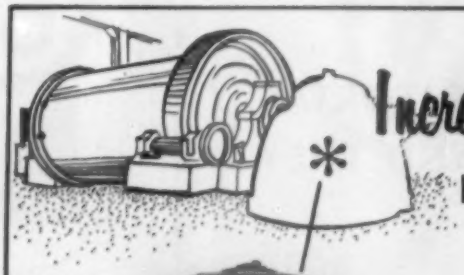
introducing
NEW Hendrick Wedge Wire

Now! With the addition of new Hendrick Wedge Wire, Hendrick rounds out its line of screens for the best in efficient, low-cost screening, sifting, de-watering and filtering operations. New Hendrick Wedge Wire not only affords tops in dependability and performance, but it's ideal wherever it's highly important for screen openings to be minutely fine, and have excellent draining qualities yet have a high degree of accuracy and absolute rigidity. For details on Hendrick Wedge Wire's free clearance, rugged mechanical and lateral strength, maximum load carry capacity, percentage open area and long wearing life, contact your nearby Hendrick representative.

Hendrick
MANUFACTURING COMPANY
47 Dundaff Street, Carbondale, Pa.
Sales Offices in Principal Cities

SEE OUR CATALOG IN SWEET'S

Perforated Metal and Wedge Wire • Perforated Metal Screens • Architectural Grilles • Wedge Slot • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids



Increased* CEMENT PRODUCTION
BRADLEY HERCULES MILLS

The quickest, most economical way to increase your grinding capacity

For the cement manufacturer with excess kiln capacity . . . here is the answer to INCREASED CAPACITIES at an appreciable SAVING IN HORSEPOWER. The Bradley Hercules Mill, used as a preliminary pulverizer before compartment mills or tube mills, results in INCREASED PRODUCTION of finished material at a LOWER COST per barrel.

Rugged, dustless construction, maximum accessibility keep maintenance costs at an absolute minimum.

Automatic electrical feed control eliminates manual operation.

For complete information, write for Catalog No. 57

Bradley PULVERIZER CO.
LONDON ALLENTOWN, PENNA. BOSTON

WHY NOT SUBSCRIBE TO ROCK PRODUCTS?

You will get a monthly magazine that will be loaded with "KNOW HOW" type of articles.

Remember **ROCK PRODUCTS** is Edited by graduate engineers who know **YOUR INDUSTRY.**

READERS EXPECT MORE EDITORIALLY FROM ROCK PRODUCTS AND THEY GET IT EVERY MONTH.

SEND IN YOUR SUBSCRIPTION CARD TODAY, AND WHY NOT SUBSCRIBE FOR 3 YEARS

CONCRETE PRODUCTS

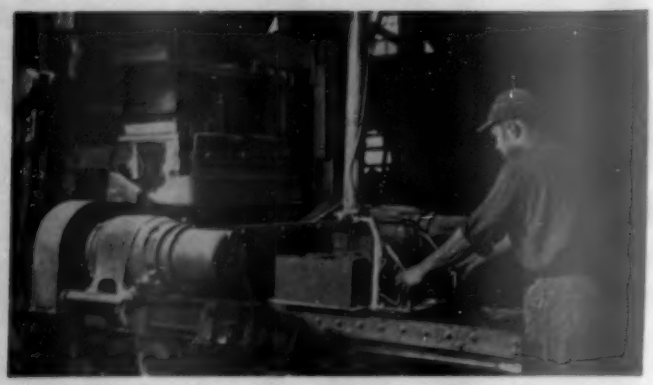
A SECTION OF ROCK PRODUCTS

CONCRETE UNITS · READY-MIXED CONCRETE

Straight-line production plant operated by Concrete Pipe, Inc., Evansville, Ind.

CONCRETE-BLOCK MANUFACTURER SAYS:

"Our repeat sales tell the story of better blocks made with Duraplastic*"



Lima Cement Products Company workman lifts three green concrete blocks made with Duraplastic from machine.

HERE is Standard Oil of Ohio's bulk storage building at Lima. Duraplastic block from Lima Cement Products Company was specified by sub-contractor for masonry Floyd Stemen, Lima, Ohio.

HERE, TOO, Stemen chose Duraplastic-made block from the Lima Cement Products Company. This is the new Kroger store on the main street of Lima.

"We've found that uniformity and high strength of concrete blocks are two big factors in getting repeat orders," says Bill Ebling, vice-president, Lima Cement Products Co., Lima, Ohio. "During the last seven years we've depended on Duraplastic air-entraining cement to help us build these qualities into our product."

More and more manufacturers are discovering the repeat sales appeal of concrete products made with Duraplastic...the economy this cement offers in production and handling. Mixes are rubbery and cohesive, feed easily through machines and produce concrete highly resistant to the passage of water.

YET DURAPLASTIC COSTS NO MORE

It sells at the same price as regular cement and requires no unusual changes in procedure. Complies with ASTM and Federal Specifications. For descriptive booklet, write Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Avenue, New York 17, N. Y.

NIFTY SAYS: The appearance of Duraplastic-made products works for you as a built-in salesman. Customers go for the clean, true edges and the richer face texture—especially when harsh aggregates are used.

THRIFTY SAYS: Build up profits and cut down production costs with Duraplastic. Manufacturers find less breakage in handling green machine-made products . . . fewer costly culls and throwbacks.

OFFICES: Albany • Birmingham • Boston • Chicago
Dayton • Kansas City • Minneapolis • New York
Philadelphia • Pittsburgh • St. Louis • Waco

*"Duraplastic" is the registered trade-mark of the air-entraining portland cement manufactured by Universal Atlas Cement Company.

CP D-186

ATLAS®

DURAPLASTIC

AIR-ENTRAINING PORTLAND CEMENT

Makes Superior Concrete Products at No Extra Cost

UNITED STATES STEEL HOUR—Televised alternate weeks—See your newspaper for time and station.

INDUSTRY NEWS

Virginia Firms Merge

SOUTHERN MATERIALS CO., INC., Norfolk, Va., has acquired the outstanding stock of Southern Block and Pipe Corp., also of Norfolk, according to H. C. Hofheimer, II, chairman of the board of Southern Materials. Merger of the firms brings together two of the major suppliers of building materials in Virginia. Southern Block is a multi-million dollar operation, and the annual volume of business of the combined operation will be about $15,000,000.

The merger will be beneficial in enabling the two companies to pool their research and production resources. This is particularly important because of the recent interest shown by both companies in the development and promotion of prestressed and precast concrete products. Engineering and research facilities will also be broadened.

Honor Safe Drivers

ANDERSON CONCRETE CORP., Columbus, Ohio, honored 78 drivers who have had records free from preventable accidents in 1954 at its seventh annual banquet held April 1 at company headquarters. Safety Director Leo Phillips was the speaker. Safe driving certificates and cash awards were presented to the drivers, who covered more than two million miles during 1954. Top awards went to Howard Collins, Willis Wilt and Harold Rader for 7-year records.

To further honor the drivers, the Anderson firm played up their safety record in a large advertisement appearing in the local *Ohio State Journal*, in which each accident-free driver was listed according to his record.

Pittsburgh Flexicore Plant

PITTSBURGH FLEXICORE CO., INC., is building a new plant at Monongahela, Penn., to manufacture, sell and erect Flexicore precast concrete slabs in western Pennsylvania. Initial capacity of the plant will be 700,000 sq. ft. of slabs annually on a one-shift basis. The slabs will measure 8 x 16 in. (in lengths up to 26 ft. 8 in.) and 6 x 16 in. (in lengths up to 22 ft. 6 in.).

President of the new firm is Frank O. Patterson, owner and president of Patterson Supply Co., Inc., Monongahela, Penn. Arthur C. Grafflin is vice-president and manager.

Awarded Zonatile Franchise

NATIONAL CEMENT PRODUCTS CO., Toledo, Ohio, has been awarded a Zonatile manufacturing franchise by the Zonolite Co., Chicago, Ill. The Toledo firm, headed by C. B. Fellabaum, will distribute the pre-cast insulating concrete roof decking in the Michigan and Western Ohio area. National is the third firm to be awarded a Zonatile franchise.

Cover Picture

ON THIS MONTH'S CONCRETE PRODUCTS cover is an illustration of the modern concrete pipe plant of Concrete Pipe, Inc., Evansville, Ind. In the background may be seen the tower for material bins and cement silo, providing gravity feed to mixer and pipe machines. In the foreground is the curing room. The plant has a backlog of orders which will require two years to fill.

North Carolina Ready Mix Plant

CONCRETE MATERIALS INC., Charlotte, N. C., will place into operation a new ready-mixed concrete plant near Charlotte early this summer. The plant, featuring automatic batching controls, will be similar to but smaller than the firm's main plant on Creosote Road. Concrete Materials also operates a large precast prestressed concrete products plant in Charlotte.

Unit Masonry Exhibit

UNIT MASONRY ASSOCIATION of Kansas City moved forward in its campaign to encourage masonry home building by sponsoring an attractive exhibit at the Kansas City Home Show held early in April. Various masonry materials were shown in wall sections. In addition, exhibitions and contests for apprentices of the industry were held, with cash prizes amounting to $350. A surprise feature was a "lady" brick layer who volunteered to show the crowd a thing or two about the bricklaying art.

A woman brick layer performs at the Kansas City Home Show (Unit Masonry Association of Kansas City booth)

JACKSONVILLE CONCRETE CO., Jacksonville, Fla., opened up one of the most modern ready mix plants in the Southeast early in March. Costing $500,000, the plant produces 1000 cu. yd. per day. The new installation includes an office and warehouse, two batching towers, and a large storage yard served by shuttle belt and reclaiming tunnel belt conveyors. A new block plant is now under construction at the Jacksonville site. The firm, headed by Martin Stein, president, Ben Stein, vice president, and Albert Stein, secretary-treasurer, operates 28 transit mixers.

TEZONTLA Y ARENA, a new volcanic cinder product company at San Quintin, Baja, Calif., shipped its first boatload of cinders (1400 cu. yd. load) to San Diego block producers. According to Rafael T. Orendain, president, this is the first shipment of natural resources from Baja California to arrive in San Diego in large quantity.

SHORE ENGINEERING, New York, N. Y., has completed negotiations with a prominent manufacturing corporation and is now prepared to arrange for the complete installation of high pressure steam curing systems for block plants which may be purchased on deferred payment plan.

KUHNS CONCRETE CO., Springfield, Ohio, headed by John D. Kuhns, has taken over all the assets pertaining to the ready-mixed concrete business of Beckley and Myers Co. However, personnel, operations, and company name will remain the same.

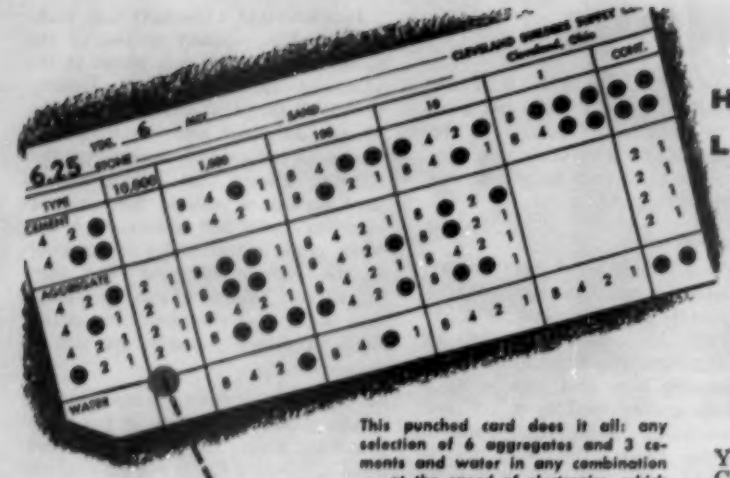
FALCON COVE SAND AND GRAVEL CO. has been formed at Arch Cape, Ore., by J. H. Scott and Ivan L. Fish of Nehalem, Ore. The plant produces ready-mixed concrete, sand and gravel, and pit run. Crushed stone will be added to the line in the future.

THE ALTON BRICK CO. of Alton, Ill., has increased daily production at its lightweight aggregate plant in St. Louis, Mo., by 50 percent. Where only two grades of aggregate had been produced, four are now produced: coarse, intermediate, fine and block mix.

PLATTE VALLEY CEMENT TILE MANUFACTURING CO., Fremont, Nebr., was swept by fire recently, which destroyed two gas pumps and a pump house. The fire started from gasoline which overflowed while being unloaded from a transport into a 5000-gal. storage tank.

NEW WINDSOR READY-MIX CO. has started operations at its ready-mixed concrete plant at New Windsor, Ill.

BAYVIEW TRANSITE MIX CO., Seaside, Ore., is building a ready-mixed concrete plant at Ilwaco, Wash.



This punched card does it all: any selection of 6 aggregates and 3 cements and water in any combination — at the speed of electronics, which is 186,000 miles per second.

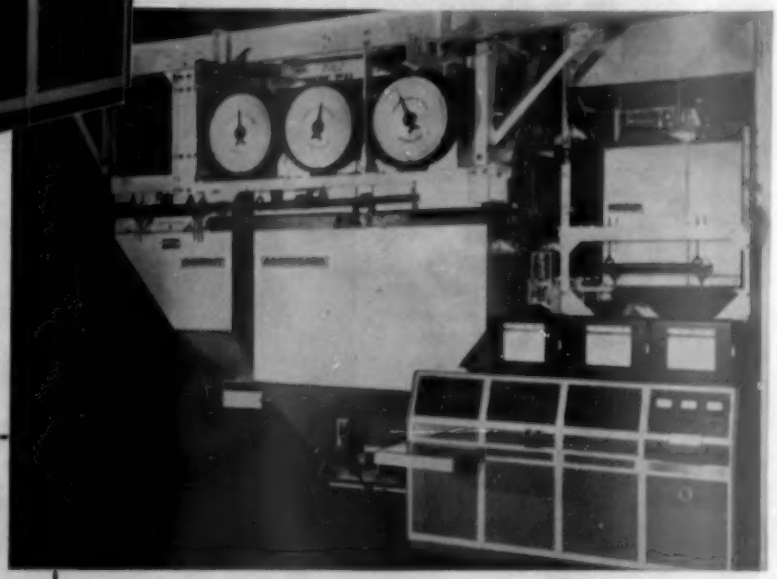
HAVE YOU LOOKED INTO THE BUTLER XK-1 Punched Card Electronic Batcher?

You should, because BUTLER Punched Card Batching is changing production-planning in the Ready-Mixed Concrete Industry. BUTLER Punched Card Batching is of *immediate* importance, for the equipment *can be installed on any existing Ready Mixed Plant* — no matter who the manufacturer.

And the BUTLER XK-1 is of *immediate* importance because of absolute quality-control. The Ready Mixed operator who converts to BUTLER Punched Card Batching has an enormous competitive advantage. The BUTLER XK-1 takes the costly human element out of batching. That alone carries a powerful selling impact for *your* concrete.

But just as important is the cost-saving *simplification* of paper work for your organization.

The punched card is a legal, permanent, finger-tip file-record which can be re-used tomorrow or a year from now. Invoices can be typed from the card — or with auxiliary bookkeeping, equipment, accounting can be wholly automatic. And your dispatcher can also be your batcher.



Write BUTLER BIN Company or ask your BUTLER distributor for full details. Use the coupon below, 'phone or send a postcard. But do it now to get the advantage of the BUTLER XK-1 in your market.

BUTLER BIN CO.
993 Blackstone Ave.
Waukesha, Wis.

Please send me complete description and specifications of the BUTLER XK-1 Punched Card Batcher

Name .....

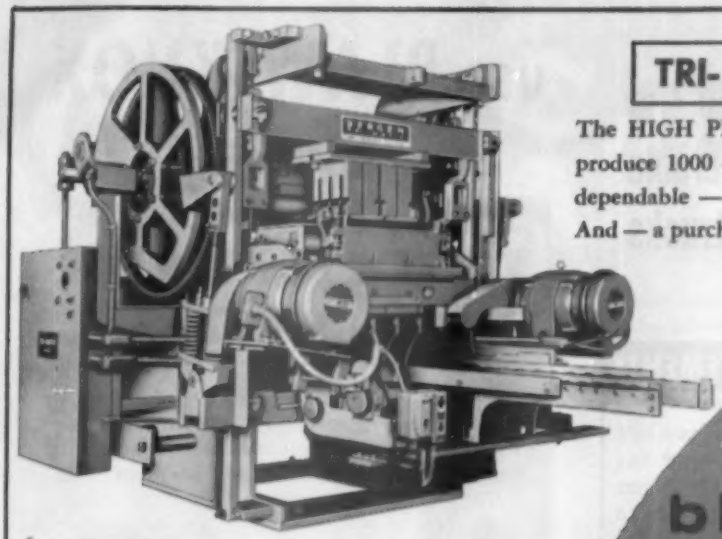
Company .....

Street .....

City ..... State .....

BUTLER BIN COMPANY

993 BLACKSTONE AVE. • WAUKESHA, WISCONSIN



TRI-MATIC BLOCK MACHINE

The HIGH PRODUCTION machine that's made to produce 1000 - 8" units per hour. Rugged, powerful, dependable — heavy duty construction throughout. And — a purchase plan to *suit you.*

MORE block plants are buying MORE BERGEN EQUIPMENT Every day!

LIGHT-WEIGHT HOIST

This light-weight hoist is a pleasure to use. #9033 requires only 13 ft. of headroom (12 ft. for #9034). Either one can be furnished with a magnetic plate.

ZerOmatic HEIGHT & DENSITY CONTROL

This device automatically controls the amount of material flowing into the mold and the length of the vibration period. The result is more uniform, cleaner, sounder block. Complete with 10 H.P. machine drive motor and microflex timer.

MASTER CONTROL PANEL

This panel centralizes machine control components in one heavy-duty steel box. It includes a circuit breaker with safety disconnect handle, transformer, magnetic contactors with overload relays, rectifiers, (AC/DC) for magnetic brakes and off-bearer, terminal blocks with complete bank of fuses for circuit protection. It is designed for floor mounting,—detached from the machine to eliminate vibration.

Phone "Collect" or write for complete details and prices of these or any other Bergen products.

BERGEN
MACHINE & TOOL CO., INC.
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Haul extra yards each trip
Save time with more maneuverable short wheelbase trucks

USE BLAW-KNOX *Hi-Boy* TRUKMIXERS

How would you like to haul a load or two more a day... and carry maximum legal pay load each trip?

You can do it easily with Hi-Boy Trukmixers!

Hi-Boy 4½, 5½ and 6½ cu. yd. Trukmixers are designed to solve three profit-stealing problems... weight, length and axle load. Combining the flush water tank and pedestal, reduces total weight of the unit by about half-a-ton and substantially lowers the center of gravity of the mixer. Locating the engine to the left rear permits moving the mixer forward 20" and shifts the load center of gravity closer to the front axle so it can carry more of the legal weight allowance. These design improvements let you use highly maneuverable short wheel base trucks that get you through traffic, into the job site, up to the forms and back to the plant *fast*. In the time saved you can often haul an extra load or two a day!

MORE *Hi-Boy* DESIGN IMPROVEMENTS

Large Diameter Short Drum mixes even zero slump concrete fast and thoroughly. Concentrates batch at front end for better over-all weight distribution.

Big Inner Cone for Fast Charging . . . 8-9 seconds per yard . . . and eliminates spilling of materials.

Better Blade Design, with flange on the discharge side, prevents segregation during discharge.

Low Maintenance results from the accessibility of the side-mounted transmission and engine, which permits easy inspection of vital parts. Engine and radiator enclosed against all weather conditions. Inexpensive, easily cleaned air filter protects the radiator.

Be sure to investigate the many more profitable, practical Hi-Boy features before you decide on any truck mixer . . . and ask your Blaw-Knox distributor to explain the advantages of the Blaw-Knox "Complete Ready-Mix Package."

BLAW-KNOX COMPANY
CONSTRUCTION EQUIPMENT DIVISION

Pittsburgh 38, Pa.
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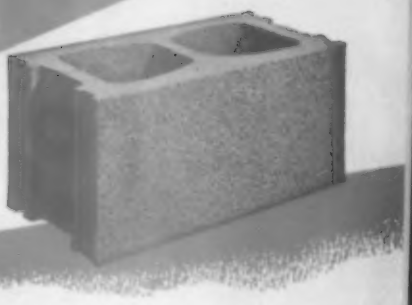
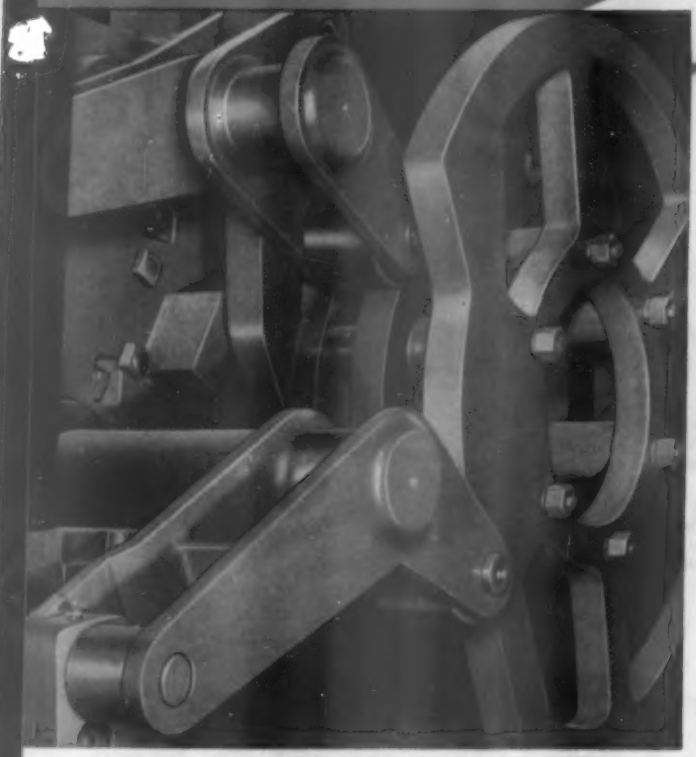
Only a Besser Vibrapac is *Fully CAM OPERATED!*





Illustrating the cam and roller principle of the Besser Vibrapac. Only a few moving parts. You get high production with these slow, revolving cams and long machine life.

Many concrete block plants are now running on a 24-hour a day schedule of uninterrupted production, day-in and day-out. This is made possible by the exclusive Besser cam and roller principle of power application which assures smooth, continuous operation.

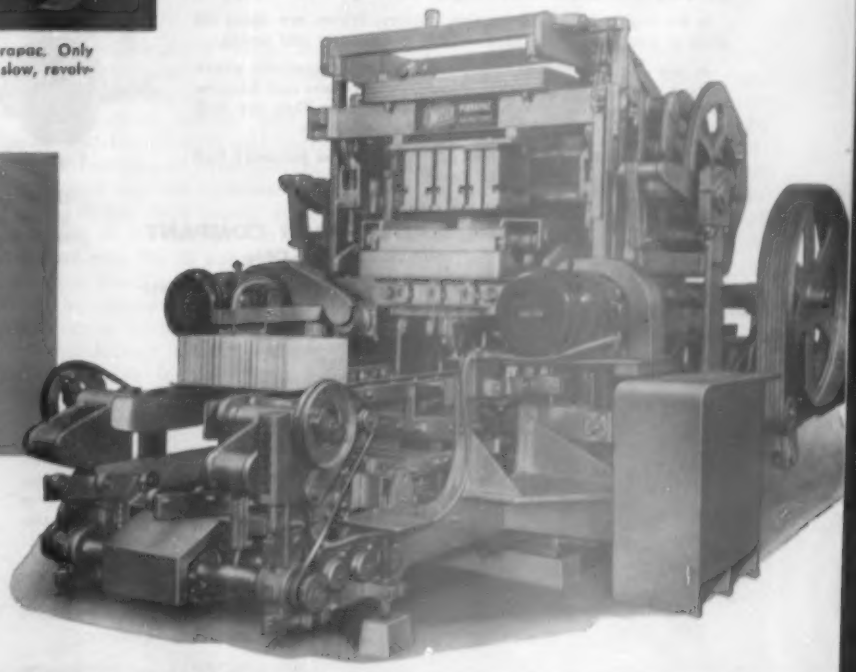
The rugged steel cams and heavy duty alloy steel rollers and large diameter shafts provide an exceptionally long service life and dependability. The cams are machined from a single piece of steel having a thickness of 2". The entire wearing surface is heat treated and hardened.

Let's examine a Vibrapac. You'll find there are no pistons . . . no valves . . . no leaking liquid . . . no interlocked operations. One operation does not trip the next. Each one is perfectly timed. There are no lost motions between the various operations of feeding . . . vibration . . . striking off surplus concrete. . . stripping finished block . . . delivering finished block to front of machine . . . and placing new pallet under mold. This accounts for the unusually high production of uniformly high quality block.

Only a Besser Vibrapac is fully cam operated. The rugged simplicity of the Besser Cam and Roller principle of operation is one of the greatest contributing factors to the universal acceptance of the Automatic Vibrapac.

A CAM has a Perfect Memory!

The cam and roller principle of operation is the simplest method of power application. A slow revolving cam, with a roller riding on its surface, actuates an arm that delivers power with pin point precision and with steady, uninterrupted regularity. A cam virtually "thinks" for you . . . has a perfect memory.



Front Pallet Feed Vibrapac
— the modern, fully automatic concrete block machine. Produces three 8" x 8" x 16" modular units at a time on one plain pallet. Other sizes produced in equivalent multiples on the same set of plain pallets. No machine operator is required. Hand labor is reduced to pushing a switch button and guiding a power offbearing hoist. One man removes finished block, and, with no lost motion, returns empty pallets to the Vibrapac.

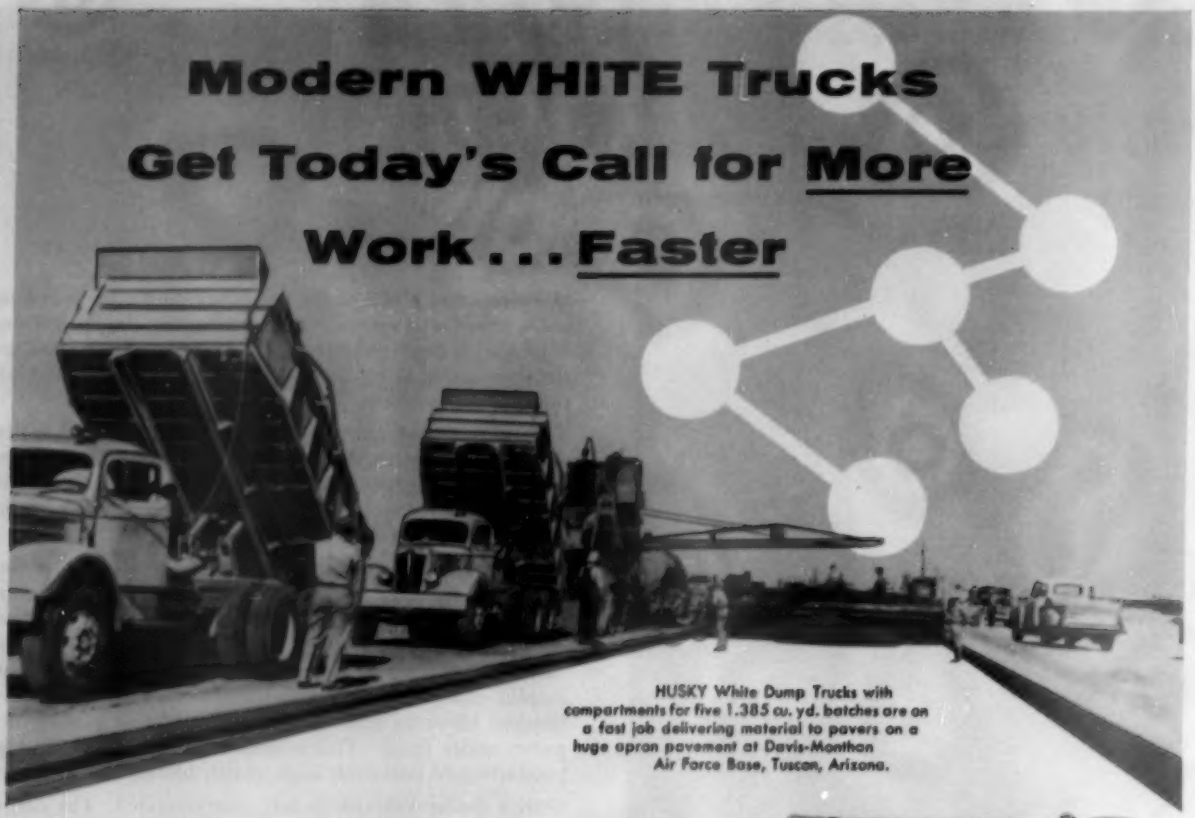
A 7200-1PBCR

BESSER COMPANY

BOX 135 • ALPENA, MICHIGAN, U. S. A.

Complete Equipment for Concrete Block Plants

Modern WHITE Trucks Get Today's Call for More Work . . . Faster



HUSKY White Dump Trucks with compartments for five 1.385 cu. yd. batches are on a fast job delivering material to pavers on a huge apron pavement at Davis-Monthan Air Force Base, Tuscon, Arizona.

YOU'LL ALWAYS see White Trucks on the tough jobs where schedules are tight, loads are big and working conditions rugged.

In the big and busy construction industry, Whites are doing all kinds of jobs with remarkable records of time and cost saving.

In your business, too, Whites are a big help—especially where there is need for more work . . . faster . . . at lower cost. Because Whites are engineered right to job specifications. They are built to do your job faster, better and more economically.

Have a tough transportation job that has you puzzled? Call your White Representative . . . now!

This White Model 3022S4 six-wheeler hauls 6 yards of mix with 255 gallons of water within legal limits for Cleveland Builders Supply Co., Cleveland, Ohio.

White

THE WHITE MOTOR COMPANY
Cleveland 1, Ohio

For More Than 50 Years The Greatest Name In Trucks

MODERN DESIGN

MODERN POWER

MODERN USEFULNESS

It takes all three! And White puts them together in its complete line of motor trucks engineered to exact operating conditions for new usefulness, new economy and new efficiency.

MODERN DESIGN! There's nothing like the White 3000 with the power-lift cab. New payload advantages! Exclusive design and weight distribution.

MODERN POWER—yes! With the amazing higher-compression White Mustang Engines in a range of sizes up to 200 hp. More power per pound of engine weight!

AND USEFULNESS! It's the big pay-off with the White 3000 because these handsome, new Whites get more work done, in less time, at lower cost.

There's a White That Will Cut Your Costs . . . Earn Money For You—Do More Work.

Overall view of plant showing sand freighter unloading to stockpile. Note reclaiming conveyors along river. Auxiliary batching plant and washout facilities may be seen to the right, and on the left is the garage and boiler house

Punch Card Batching of Concrete

• Cleveland Builders Supply Company's new electrically controlled ready mix plant, designed for a variety of aggregate mixes, with a capacity of 180-200 cu. yd. per hr., using only four operating employes for the entire operation

By BROR NORDBERG

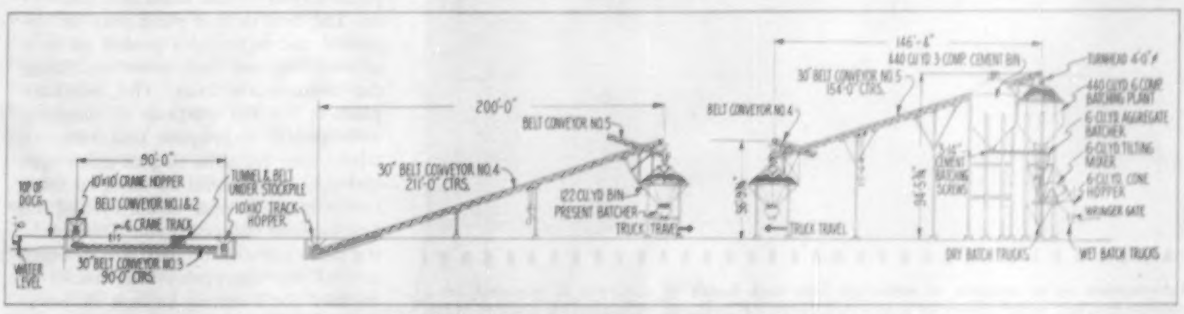
PLANT "J" OF THE CLEVELAND BUILDERS SUPPLY CO., Cleveland, Ohio, is possibly the largest entirely new commercial central-mixing concrete plant to be built in the United States. It has a batching capacity of 180-200 cu. yd. of concrete per hour and started production in April, 1955.

This plant is the first to utilize the recently developed Butler batching system whereby punched cards bearing the necessary specification data, and electronics are the means for automatic batching of cement, aggregates and water. A perforated card is made up indicating the weights of materials for each specified mix, it is inserted into a slot, a button is pressed and the mix is automatically proportioned for discharge into the mixer.

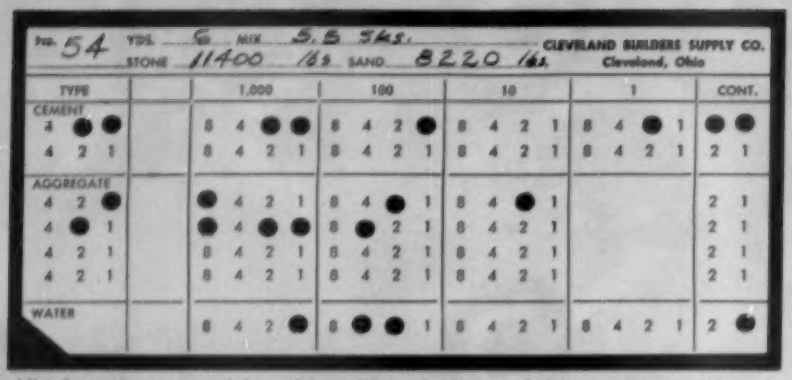
This batching system, along with other electrical controls and interlocks for the handling of materials and the dispatch of concrete, combine to make this plant the most nearly automatic operation in the industry. It requires but four men for its entire operation, including handling of the aggregates from storage and the cement from railroad cars or from bulk cement trucks right on through to the discharge of mixed concrete into the truck mixer drums.

This is the first completely new plant built by the company in many years and its basic design stems from 26 years experience in the vagaries of ready-mixed concrete by one of the nation's largest producers. The company sought to apply the absolute last word in technological progress, for efficiency, compactness, flexibility and accuracy of control for quality in this plant.

Plant "J" was built because the company was forced to give up two other locations in Cleveland. A plant at East 40th St. and the lake front was removed because of the construction of Cleveland's lake front freeway. The Cuyahoga River straightening and



Elevation details of batching plant, track unloading and storage reclaiming facilities



All information as to weight and ingredient selection are fed into automatic electronic batching instrument by means of a pre-punched card bearing the required specifications. The numbers represent 8, 4, 2 and 1 lb., in the 10's column; in the 100's column, the numbers represent 80, 40, 20 and 10 lb., etc. Weight increments are 1 lb. for cement and water, and 10 lb. for aggregate

widening projects required removal of the company's docks where aggregates had been received by lake freighters for many years.

Land available for a new plant and for a dock was limited, and the site chosen was the former location of an old shipyard. It is on the Cuyahoga River, at Jefferson St. in the industrial flats, about two miles from downtown Cleveland. The location is ideally suited for city-wide deliveries but is limited to 3.2 acres of land whereas the older plant had 16.8 acres.

Availability of space was a factor in design of the entire operation. Docks had to be built to accommodate lake freighters and to provide necessary storage for aggregates not only for the new concrete plant but to supply bulk and dry-batched materials to the construction trade. The company is a very large building supply dealer.

It was also desired to have a ready-mixed concrete operation equipped to supply any mix or type of concrete, whether it be of Haydite, slag or other special aggregate, and it was necessary to have truck mixer wash-out facilities on the grounds as well as a boiler house, certain maintenance facilities and a dispatching plant office. All this was accomplished in a very compact layout that also features paved one-way roadways throughout, a 50-ft. Fairbanks, Morse platform scale for the weighing of bulk cement or aggregates in trucks and facilities to receive special aggregates by truck and bulk cement either by rail or truck.

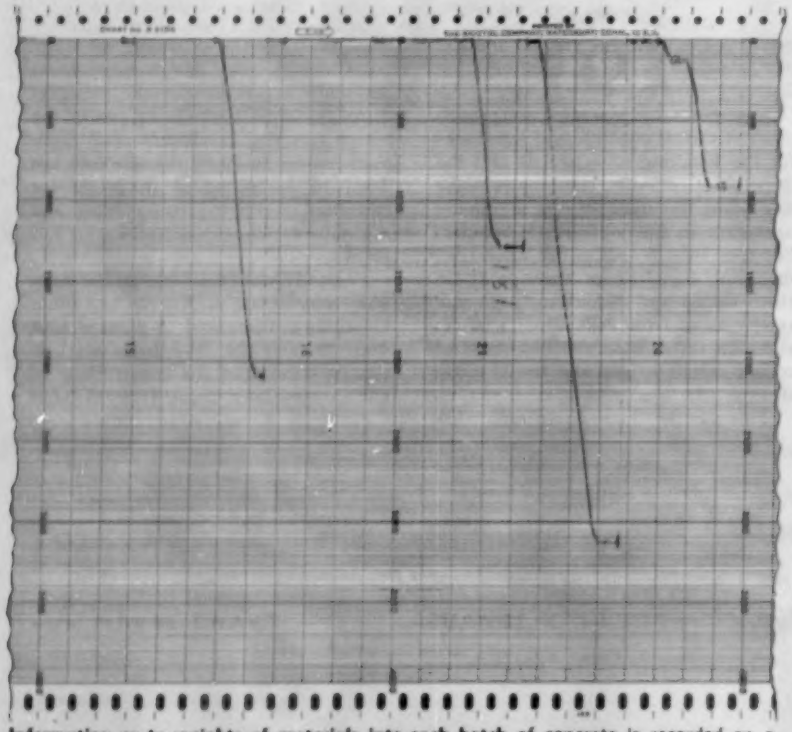
Cleveland Builders Supply Co. operates two transit-mix batching plants in addition to plant "J" and has a total of 60 mixer trucks. They are of 5 and 6 cu. yd. capacities and 34 of them are assigned to the new plant. Ready-mixed concrete is sold exclusively on the basis of quantity of cement in terms of sacks per cu. yd. as contrasted to strength concrete.

The punch-card and electronics batching system for proportioning was selected for accuracy in the reproducibility of properties of concrete made from a given batch. It was desired to minimize to the utmost the human variable in the selection of materials for a batch of concrete, in the setting of scale poises and in the accuracy of weighing out and the cutting off of bin gates. It has been the experience that batching plant operators very often weigh out excesses of cement and aggregates in their attempts to batch out full measure of materials when operations are manually controlled. Too much dependence was on the dexterity and quickness of operators in the shutting off of the supply of materials. Considerable saving is anticipated through giving exact measure of these materials.

Also, it is anticipated that the speeding up of batching operations will enable the dispatch of six cubic yards of concrete per truck mixer load at two-minute intervals which will keep the truck mixers operating at a highly productive rate.

It will be seen from the accompanying plan drawing and photographs that aggregates are stockpiled in separated sizes along the dock and that belt conveyors are used for reclaiming. Field hoppers are fed from stockpiles by a locomotive crane and horizontal field conveyors deliver to a cross conveyor from which an inclined belt conveyor transfers materials for batching.

First, there is an auxiliary batching plant served by the main belt conveyor. The bins in that plant may be bypassed and aggregates passed on to a second inclined belt conveyor filling the main plant bins. The auxiliary plant is for the purpose of batching out special aggregate concrete, in which case Haydite, slag or other special aggregate would be dumped from trucks into a hopper at the foot of the first inclined belt conveyor. This batching plant can also be used to dry batch any of the aggregates into trucks or be used for batching in case of emergency.



Information as to weights of materials into each batch of concrete is recorded on a recording chart which provides a positive check of amounts of materials against those specified on the punched cards

One man is required to operate the locomotive crane and a second is stationed at the truck hopper at the transfer point to the first inclined conveyor. He has the necessary controls at his disposal and it is his responsibility to select and keep all the bins supplied. A third man operates the main batching plant. The fourth man handles the unloading of cement cars and does other necessary work around the plant.

Cost of the entire project was approximately $1,200,000 of which one-third was for the property and building of the wharf. The dock is 480 ft. long. Its construction necessitated extensive excavation and moving of mud and the driving of piling for stabilization at the river's edge and under the stockpile area. Sixty foot sheet steel piling was driven for lateral support along the river and a parallel row of 12-in. H piles, of 30 degree batter design, was driven to 60 ft. from the shore, beneath the stockpile area. This piling was capped with 4 ft. of concrete.

Due to instability of the soil, the main plant was supported on skin friction piling. The piles are 30-ton capacity steel—encased concrete piles driven to 70 ft. depth. Eighty-eight were provided for plant support.

Sources of high quality concrete aggregates are relatively few in the Cleveland area and the company brings in most of its requirements by water. Crushed dolomite, in 1½-, ¾- and ½-in. sizes, is shipped in from Drummond Island and Port Inland in northern Michigan, by self-unloading freighters carrying 10,000 to 11,000 tons. Concrete sand is presently being delivered in self-unloading freighters, carrying 1000-2000 cu. yd., from Point Pelee, which is off an island on the Canadian side in Lake Erie, and from Erie, Penn.

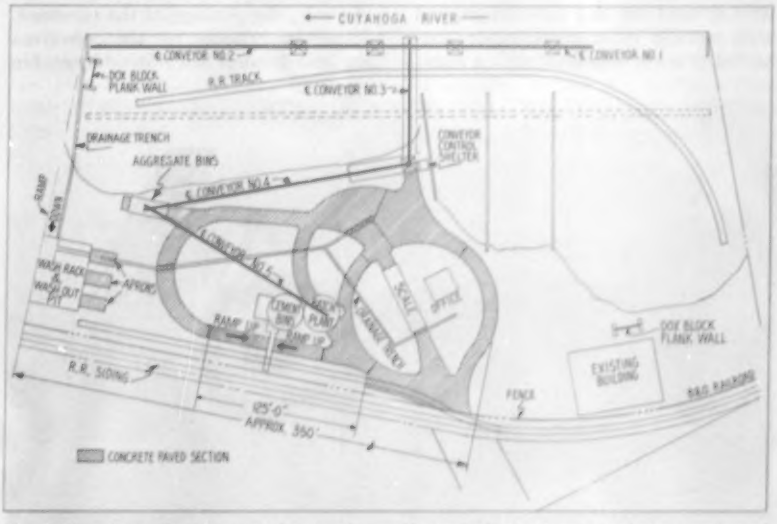
Storage capacity at the plant is 45,000 tons of crushed stone, the piles paralleling the river and separated by bulkheads. Sand is stockpiled, up to 30,000 tons, along the river at the opposite end of the dock. A 1¾-cu. yd. locomotive crane operating on rails paralleling the river is the means of reclaiming both coarse aggregates and sand for transfer to the plant.

There are four 10- x 10-ft. crane hoppers straddling 30-in. horizontal reclaiming belt conveyors at convenient points with respect to the stockpiles, and they are fed by the crane. The sand conveyor and the coarse aggregate conveyor are alongside the river and run in opposite directions, delivering to a common 30-in. belt conveyor, 90-ft. centers, at right angles to the river. This conveyor terminates at a 10- x 10-ft. truck hopper where the conveyor operator is stationed in a shelter in which he has the controls for disposition of the aggregates.

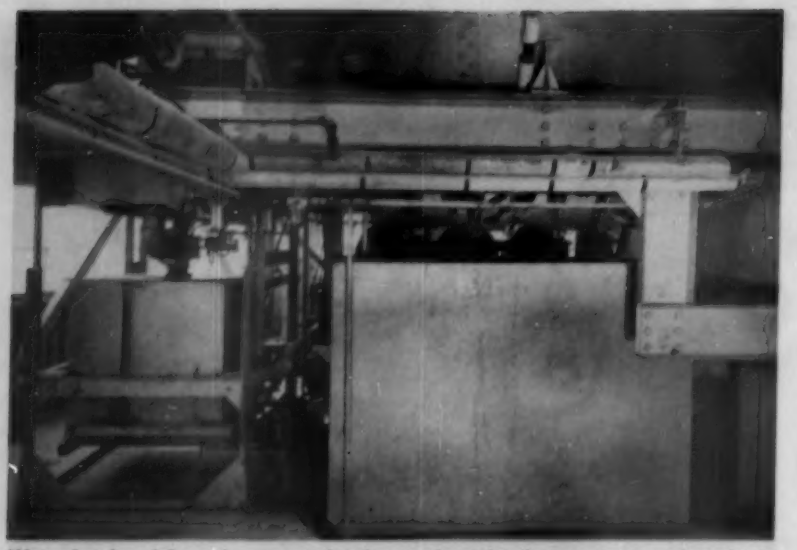
Close-up of electronic batching system showing operator Leonard Palcisko inserting a punched card into electronic reader. To his left are manual start buttons. Scale dials are for manual operation or to check on accuracy of weights in automatic operation. Recording charts give positive weight information on all batches

From this point, aggregates from the stockpiles or those received by trucks are sent on up to the bins of the auxiliary batching plant or to bypass these bins for delivery into the new central-mixing plant bins. An inclined 30-in. belt conveyor, on 211-ft. centers, delivers to the small batching plant and a flop-gate over the bins is the means of by-passing them. Transfer is to a 30-in. belt conveyor, 154-ft. centers, delivering into the main plant bins. Belt conveyors are of Barber-Greene manufacture and capacity of the aggregates handling system is 350 t.p.h.

Having the intermediate small batching plant provides flexibility and is a factor in keeping the new concrete plant operating at maximum capacity. Its main purpose is for batching concrete of special aggregates, which is done without interference with the main plant and thus eliminates the necessity of cleaning out bins. Among aggregates so handled are Haydite, slag, gravel coarse aggregate and silica sand which is sometimes specified. They are all received by truck. Perlite ready-mixed concrete is occasionally ordered for insulating roof deck-



Plan of batching plant layout, showing how efficiently limited space is being used, and the large amount of paved area



Water batcher, left, and aggregate batcher, to the right. Aggregates are released into hopper by air-activated bin gates. Operator's station is on far side

ing, and this is batched independently, using bagged aggregate from the company's perlite expanding plant.

The auxiliary batching plant is also available for dry batching into trucks, but that is ordinarily done at the main plant by by-passing the central mixer. It is a Butler plant with 122-cu. yd. capacity in four compartments. Mixer trucks charged at this plant must make a stop at the main plant to take on cement.

Bins and batchers in the main central-mixing plant are of Butler manufacture and the design is for gravity flow. The overhead bins provide storage of 450 cu. yd. for aggregates in a 6-compartment bin of 26-ft. diameter. Bulk cement is stored in a 3-compartment bin of identical capacity.

All bins have high and low bin level signals and control switches. These level devices are of a new design, and each consists of a small motor connected to a vertical shaft with a right-angle blade on the end. There is one installed near the bottom within each bin and a second near the top, with the motors housed for protection. Provision is made, through a shaft slip arrangement, to indicate when a bin is low or high. Should the bin be full, the shaft blade on the upper unit cannot turn and that condition is so indicated on the electrical controls. If the level in the bin falls below the blade, it will start to rotate. Similarly, should the bin level drop too low, the blade on the lower unit will start to turn.

The aggregate bin has a 4-ft. diameter motor-driven turnhead and position indicating and interlocking system. A cubicle is provided the operator at the truck hopper with a signal panel to indicate the levels in the several bins, the position of the turnhead and providing the control switches for changing the position of the turnhead. Start-stop switches for the conveyors are also located here. Should any bin require filling, as indicated by signal light, the operator presses a button to spot the turnhead properly and starts the belt conveyors. Lights indicate when they should be stopped. All conveyors are electrically interlocked and are covered for weather protection. When filling the auxiliary plant bins a cable system and turn-wheel at the operator's station is the means of selecting the desired bin.

Locomotive crane loading aggregate into field hopper straddling reclaiming belt conveyor

Central-Mixing Plant

The central mixing plant is an impressive structure standing almost 100 ft. high, with overhead aggregates and cement bins. It is of reinforced concrete and structural steel construction, completely enclosed with Transite corrugated asbestos-cement siding and roofing. Adequate windows are provided at the operator's station on the batching floor, the mixer level and ground level. Neon lighting and projection-type space heaters have been provided, and a 70-ft. man-lift is available for use by the men.

Bulk cement is received by rail on a B & O siding alongside the plant, and the discharge hopper may also accommodate bulk cement trucks. A 10-in. diameter screw conveyor and 102-ft. high enclosed bucket elevator deliver the cement overhead to a turnhead. A position indicator for the turnhead and bin level indicators is located on a panel at the track hopper. Cement storage capacity is 3000 bbl. in three compartments, providing substantial reserve and for the handling of several brands or types of cement. Standard portland cement is usually used and Darex, Pozzolith or calcium chloride are added in the batch from dispensers when specified.

This is a 6-cu. yd. batching plant, with 6-cu. yd. aggregates and cement batchers and a 6-cu. yd. Smith tilt-type control mixer which is driven at 9 r.p.m. by a 100-hp. motor. The mixer is supported on its own foundation so the plant is almost entirely free from vibration.

Mixing tanks for Darex air-entraining agent, calcium chloride and Pozzolith are located on the ground floor with their pumps which are automatically operated by the batching operator. All bin gates and valves throughout are pneumatically-operated through solenoid valves for positive and quick shut-off and opening. A 237 c.f.m. compressor and air receiver are located on the ground floor, and the air pressure is reduced from 115 p.s.i. to 60 p.s.i. to operate the rams.

Three 14-in. horizontal cement batching screw conveyors are the means of transfer of cement from the respective cement bins to the batcher. They are each chain-driven by elec-

Left: Plant stands about 100 ft. high. Note surge hopper from which truck mixers are charged. Auxiliary batcher for special aggregate mixes is in background

Right: Close-up of one of company's modern truck mixers. Surge hopper contains 6 cu. yd. of mixed concrete. Left to right are: C. J. French, manager of the Concrete Division; vice-president, Jay C. Ehle; superintendent, Ralph Rainartz; the driver, and field engineer, Robt. W. McCormick

tric motors through a unique arrangement whereby a ram-operated (pneumatic) clutch automatically switches from a high speed to dribble-speed motor drive as the cement approaches the called-for weight in the batcher. Usually, two of the screws are operated simultaneously in filling the hopper. Cement bins are aerated and there is a pneumatic vibrator on the cement batcher hopper.

Heat for winter operation is to be supplied from two 80-hp. Cleaver-Brooks, automatic oil-fired steam generators. Water will be heated in a 1050-gal. water heater furnished heat by a controlled steam supply, for transfer to a 480-gal. water tank.

After the concrete is mixed, the operator presses a button to discharge the mix into a surge hopper from which the truck mixers are charged through a sleeve spout. This surge hopper has 6-cu. yd. capacity which is the capacity of the central mixer and the amount carried in each truck mixer. It has a design to make it free flowing, and a pneumatic ram actuates the bottom valve to release concrete.

Having this surge capacity provided permits the operator to batch and mix 6 cu. yd. of concrete while a second batch is in the hopper ready to charge a truck mixer. It is expected that a two minute loading schedule per truck mixer will be attained as called for in the design. Dry batches may also be loaded out simultaneously with mixed concrete, through use of a flop-gate, or diverter, which by-passes the central mixer to bulk trucks.

Batching

The batching operator's station is 70 ft. above the ground and extends out from the main building a few feet to permit maximum visibility. He is surrounded by windows so he can observe the entire yard and he also can see through open grating the central mixer, surge hopper and truck mixers charged below. He has before him all the controls for the punched card batching system, the optional manual controls, starting switches for the mixer drive, additive controls, etc. He has a telephone at hand, signal horns, and an inter-communication system has been provided to the ground level and other buildings.

Electronic engineers of Fairbanks, Morse & Co. developed the punch-card-electronics batching system in collaboration with Butler Bin Co., and it is designated the Butler Bin Type XKI batching system. The objective was ease of operation, accuracy and dependability through substitution of electronics for manual effort.

It is equipped for either automatic operation or manual push-button operation at the option of the batching man. Should anything go astray, he can quickly change to manual operation or, should the weights be off for any reason as readily seen on dial scales he may quickly make adjustment by push-button. There are three Fairbanks, Morse dial scales; a 5000 lb. scale with 5-lb. graduations for cement, a 25,000-lb. scale with 25-lb.

Washout facilities for cleanout and cleaning up of trucks. Bucket loader, right, is shown cleaning out concrete at washout rack

Drives for cement batching screws, above. Ram-operated clutches are means to regulate speeds from high to low motor drives in reaching exact weight in batcher

graduations for aggregates and a 2000-lb. water scale with 2-lb. graduations.

The system is designed on a dry weight basis as indicated on the punched cards, and compensation is made for moisture automatically through a dial setting. Moisture in the sand is measured at frequent intervals by drying samples, and the percentage is set on a dial. When the batching cycle is started, the correct addition of extra sand and the corresponding subtraction of water are automatically made. The circuits go farther than that in their accuracy and compensate automatically for the water that is contained in the make-up sand which also contains moisture. Thus, an over-correction is made to arrive at a truly accurate figure.

Adjustable approaches into the batchers at reduced feed rate are provided for both cement and water. In proportioning aggregates, provision is made for "lead" in the cut-off to compensate for the material still in suspension in the weigh hopper.

All information as to weights of materials into each batch of concrete is recorded on Bristol's recording instruments which provide a positive check of amounts of materials against those specified on the punched cards. These records, sometimes with comments written on them by the operator, are available at any time.

The theory of operation is very complex and not easily understood in its details, so we only briefly touch upon it. It is based on the principle that it is necessary to produce an electrical signal proportional to weight by means of a load cell, producing a voltage proportional to the force applied to it. The cell constitutes the weighing element coupled to the weighing hopper by a lever system.

The cell produces a calibrated electrical signal by measuring the elastic deformation of a steel column by

Conveyor operator's shelter at truck hopper. Note wheel for spotting turnhead over auxiliary plant bins. Inside are bin level indicating lights, turnhead position indicators, motorized turnhead position spotters for main plant and starting switches for conveyors

means of resistance strain gauges for fast response. It thus converts weight information into a proportional electrical signal.

If the desired batch be 100 lb., for example, the hopper is empty so the load cell output is zero. The adjustable preset voltage is set to 100 lb., which throws a voltage equivalent to 100 lb. into the amplifier, closing relay contacts which in turn open the supply valve.

Production begins to flow, producing a load cell output. When it equals the pre-set voltage, the amplifier input is zero, causing a relay to open and closing the supply valve.

All information as to weight and ingredient selection are fed into the instrument by means of a pre-punched card bearing the required specifications. It is then necessary to translate hole pattern on the card to a definite preset voltage. The card holes are set up in a binary coded decimal system. Thus, each decade of weight is arranged in 8, 4, 2 and 1 increments. For example, in the 10's column, the numbers represent 8, 4, 2 and 1 lb. while, in the 100's column, the numbers represent 80, 40, 20 and 10 lb.

Holes must be punched at the correct numbers or combination of numbers to obtain the desired weight. Weight increments are 1 lb. for cement and water, and 10 lb. for aggregate.

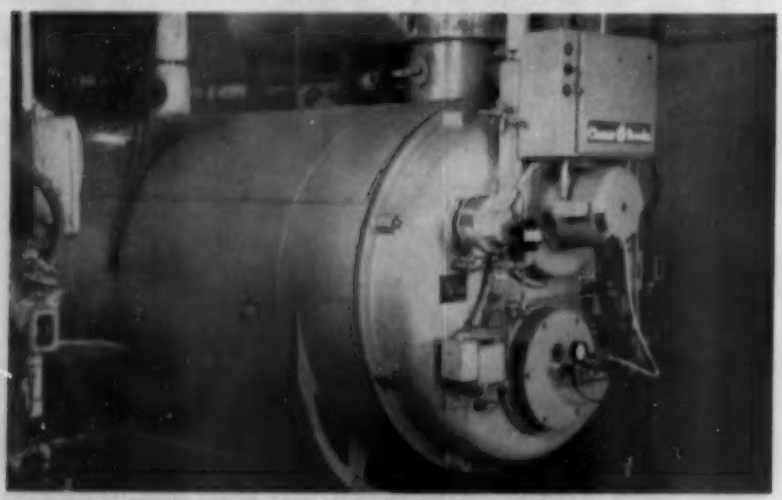
Shown herewith is a typical card measuring 3¼ by 7⅜ in., punched for a given batch. Such cards are punched by the batching plant operator for any new mix which is likely to be repeated. Normally, most customers will re-order concrete of the same specifications and cards are kept in file for the purpose.

Punching a hole will allow a pin to make a contact which will energize a relay. The relay's contact will introduce a fixed resistor into a network, the net effect producing a voltage proportional to the desired weight as determined by the punched hole or holes. If more than one hole be punched, which is the usual case of course, the effect is accumulative and the preset voltage proportional to the sum of all the holes. With 16 holes punched it is possible to obtain any one of 15,000 weights, according to the manufacturer. The card also selects ingredient types, for example, 4 to 6 aggregate bins.

The card reader in which the punched card is inserted is a device that "reads" punched hole information in the cards and translates it into electrical impulses that batching circuits can follow. It is of plastic plate in which are embedded a number of silver buttons and a pin assembly which moves forward to make contact with the buttons. If a hole is present in the card, the pin goes through it and makes a contact. Contacts actuate relays which introduce desired resistors into the preset voltage circuit.

After the card is introduced, pressing the "card lock" button energizes the card lock actuator which pushes

(Continued on page 156)



Close-up of one of two automatic, oil-fired steam generators

Compact Material Handling System for Pipe Plant

• Concrete Pipe, Inc., Evansville, Ind., produces 250 tons of pipe daily with two machines

By HUBERT C. PERSONS

East side of plant, showing main building, conveyors and cement silo. Aggregate bins are in the foreground. Curing rooms extend to the rear

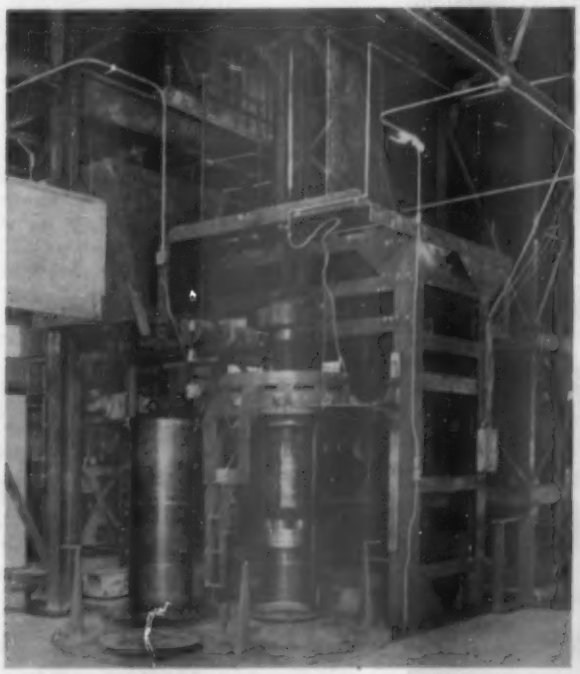
A MODERN CONCRETE PIPE PLANT under the name of Concrete Pipe, Inc., has been set up by a group of Evansville, Ind., men experienced in the concrete block and ready-mix business. The company was organized in 1953 but the plant was not in operation until the Spring of 1954. Before the end of the year the plant had a backlog of orders which will require two or more years to fill. Daily production averages 250 tons of concrete pipe of various sizes.

Plant equipment includes a McCracken pipe machine making pipe from 12-in. diameter through 36-in. diameter in 4-ft. and 6-ft. lengths. A Universal machine is also operated to make pipe in sizes from 42-in. to 72-in. in 4-ft. and 6-ft. lengths. The Universal machine is equipped to also make 8-ft. lengths.

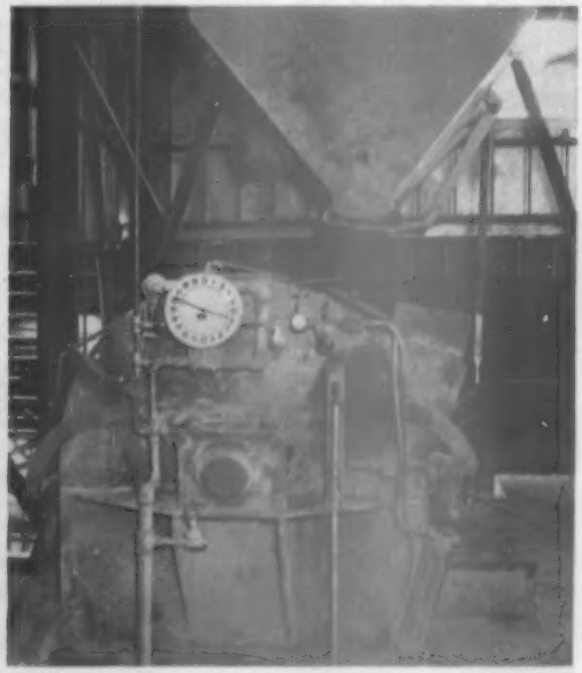
Concrete for the McCracken pipe machine is delivered by a 50-cu. ft. Besser mixer. A 40-cu. ft. Besser mixer supplies concrete to the Universal machine. A mobile weigh batcher made by the C. S. Johnson Co. proportions the concrete for either machine.

The main plant building is of steel 100-ft. x 60-ft. This is topped by a tower containing compartment bins over the mixing floor and above the concrete structure enclosing the curing rooms.

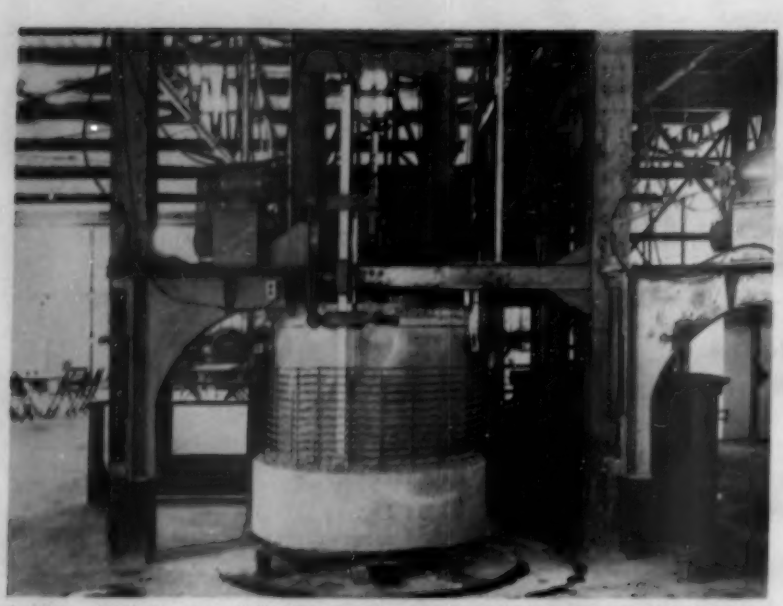
Cement is delivered to the plant in hopper-bottom railroad cars, and is unloaded into a screw conveyor which conveys the cement to a bucket elevator where it is picked up and elevated into a 75-ft. high storage silo which has a capacity of 1,032 barrels. The same bucket elevator is used to



Reinforcement in place for 24-in. pipe. One side of form has been removed to show reinforcing



A 50-cu. ft. mixer supplies concrete. Chute from weigh batcher, shown above



A 48-in. pipe being cast. Half of form has been removed to show two-cage reinforcement

convey cement from the storage silo to the cement compartment in the Johnson bin.

Both fine and coarse aggregates are delivered in hopper-bottom railroad cars and unloaded into a pit under the tracks from which a belt conveyor takes it to elevated compartment bins above the concrete mixers or to outside aggregate storage bins. The elevated bins include four for aggregates and one for cement. The outside bins at ground level have a capacity of three cars of sand, three cars of ¾-in. stone and three cars of ⅜-in. aggregate.

There are two curing rooms each 100-ft. long and 25-ft. wide. Pipe are moist cured for 72 hr. with a fog spray, the water being on for 5 min. every half hour.

Rebuilt Jeeps Carry Pipe

Two "Jeeps," redesigned in the plant, are used to carry pipe to the curing rooms. One "Jeep" is built to handle up to 36-in. pipe. The other handles up to 72-in. or 84-in. pipe. Small sizes are moved on hand trucks. Pipe in the yards are moved with a Clark yard lift. A Lown roller shapes welded reinforcing cages. Delivery to customer projects is made on 32-ft. Fruehauf flat bed trailers hauled by International R-190 series tractors.

According to Jos. Hughes, plant superintendent, the McCracken pipe machine is being operated three days a week and is turning out approximately 137 tons of pipe in an 8-hour day. The Universal machine is being operated two days a week at the rate of 100 tons per day. Currently the company is making pipe in sizes up to 72-in. for a four-mile sewer project in Evansville. The company is also supplying 36-in. pipe for a two mile sewer project in Henderson, Ky., which is across the Ohio river opposite Evansville.

Roller shaping reinforcing cage for 72-in. concrete pipe

Officers of Concrete Pipe, Inc. are: John H. Rudolph, president; Charles S. Ward, Paul Stephens and Edward N. Frissee, vice presidents; Fred Barncard, treasurer and J. H. Traub, secretary. The plant is located at 1200 N. Stanley Avenue.

A jeep converted to carry 72-in. concrete pipe

Prize-Winning Masonry Homes

PRIZE-WINNING CONCRETE MASONRY HOMES from Wisconsin, Nebraska and Michigan architectural competitions are compiled in a booklet recently published by the Wisconsin Concrete Products Association. The designs are for one-story, full-basement, two bedroom concrete masonry homes of 1100 sq. ft, and three bedroom homes of 1200 sq. ft. of floor area. The 48-page booklet, entitled "Prize-Winning Designs for Modern-Firesafe Concrete Masonry Homes," is available at a cost of 25¢ to N.C.M.A. members and 50¢ to non-members from the Wisconsin Concrete Products Association, 820 West Montana St., Milwaukee 15, Wis.

Safe Drivers Honored

ANDERSON CONCRETE CORP., Columbus, Ohio, held its annual safety banquet recently, at which 58 company drivers with no-accident records ranging from one to seven years were honored. Certificates and cash awards were presented by Sheriff Ralph J. Paul, Chief of Police George W. Scholer, Mayor M. E. Sensenbrenner, the state highway director and other safety, traffic and law enforcement officials. City Safety Director Leo Phillips was the main speaker.

PREVENTIVE Maintenance In the Ready-Mixed Concrete Industry

33: A producer views the ready-mixed concrete business. Second article of series on truck maintenance

By JAS. A. NICHOLSON*

DRIVER OPERATION may be responsible for a great many maintenance problems. Faulty driving practices may be the source of such troubles as uneven tire wear, excessive gas and oil consumption, engine failure, motor overheating, lack of power, hard steering, poor brakes, clutch slipping, shifting difficulties, jumping out of gear and axle breaking.

Faulty driving practices that start trouble include: (1) lugging the motor; (2) operating in wrong gear; (3) careless or improper shifting; (4) riding the clutch; (5) excessive speeding; (6) fast stopping; (7) crazy driving; and (8) off the highway "wear and tear."

When a new driver is placed on a truck or a driver is given the responsibility of handling a new truck, they should be given complete instructions on the unit's operation. To assure proper performance of mixer trucks, drivers must be grounded in the fundamentals of daily preparation, starting, taking-off, shifting, highway operation, off the road pulling, handling when "hung up" and truck care.

In any ready-mixed concrete operation, it should be definitely understood that each and every driver will make certain daily inspections in preparation for starting his equipment. Even if responsibility for condition of trucking equipment is placed with a mechanic or garage staff, any driver, worthy of the name, daily makes a cursory examination of his truck, if only for his own safety and protection. Before getting into the cab, a driver should walk around his unit, checking (as he walks) for any damage to truck or mixer body, tire deflation, uneven wear or tire bruises, loose rim lugs, leaks of any kind, frame cracks and wobbly front wheels. In his cab, a driver checks gauges, controls, horn, windshield wiper and lights. Every morning, before leaving the plant, a good driver makes certain that engine, battery, clutch and brakes are in proper operating condition.

In starting his truck, a driver should follow recommended procedures. The transmission should always be in neutral when the starter button is pressed. Especially in cold weather, it's good practice, when starting, to depress the clutch pedal so there won't be the added burden of turning over the transmission gears. If the starting motor stalls, the button should be immediately released. In attempting to start the engine, the button should not be held down for longer than 30 sec. at a time. Always, as soon as the engine begins to fire, the starter should be released.

If difficulty in starting is experienced, the starter button should be pressed momentarily with the lights on. If lights go off, battery connections should be checked, cleaned and corrected. If lights go dim, a weak battery is indicated. A relief battery should be installed. If lights stay bright, starting trouble should be reported to the mechanic.

As all drivers and mechanics should know, condensation in the distributor, on the wiring and around the spark plugs, will sometimes prevent the starter's operation. If a dry cloth won't do the trick, carbon tetrachloride should be used to dry up the moisture. Under no condition should solution from a fire extinguisher be used. Make it clear to all your men that fire extinguishers are to be used only for fire protection.

A driver has the job each morning of properly warming up his truck. On cold days, a motor should be turned over 700 - 800 r.p.m. until a water temperature reading above 140 deg. F. is reached. High temperature thermostats should be standard equipment. Mixer truck engines operate best at 170 deg. to 180 deg. If engines are operated at lower temperatures, condensation develops and sludge forms. To prevent sludging, keep your engines at the right temperatures. In winter, to use high temperature thermostats satisfactorily, a permanent antifreeze solution must be used in the radiators. Some large trucking firms, using 170 deg. to 180 deg. thermostats in truck engines, actually keep antifreeze in radiators the year around. This idea may represent good thinking for the ready-mixed concrete industry.

During warm-up time, a driver should check the oil pressure gauge. For each given truck, there is a range of pressure limits for both an idling engine and one speeded up. If oil pressure does not come up to expectation, the engine should be shut off and the truck garaged for repairs. If oil pressure is running high, similar attention should be given. The driver should also check the ammeter readings. If readings are higher or lower than expected, the driver should turn the truck over to the mechanic for correction.

While warming up his unit, a driver should be alert to any engine noises. Any squealings, hisses, pings and tappings or missings should be called to the mechanic's attention. Any observance of exhaust fumes in the cab should be immediately reported. On this point, it is always good practice to keep the cab well ventilated, whenever the engine is operating. There is no sense in a driver taking a chance on his health.

To prevent sludging, avoid engine trouble and eliminate shifting difficulties, many producers take these steps: (1) put 170 to 180-deg. thermostats on their present units and specify that new trucks have these thermostats; (2) use a permanent anti-freeze, the year around in their mixer truck engines; (3) use compounded high detergency oils; and (4) not only provide tachometers but also insist that drivers operate by them.

Tachometers Improve Operation

On practically all local Standard Oil Co. trucks, a Sun Electric tachometer is standard equipment. There is strong support for the opinion that every mixer truck should be equipped with a tachometer and that each driver be instructed to adhere closely to tachometer readings in shifting gears. Mixer truck engines get a lot more use and abuse than appear on the speedometer. In some states (with 30,000 to 32,000-lb. maximum weight on tandems) to get big legal payloads, the employment of medium sized trucking equipment is required. The use of a tachometer would help prevent engine and transmission trouble on trucks of this size.

When a medium sized truck is carrying a heavy load of concrete, the truck engine must be kept "wound up"

*Pres. Nicholson Concrete Co.

(motor above 2000 r.p.m.) all the time. In average city hauls, with this type of equipment, the transmissions should never be above direct drive.

To illustrate the use of a tachometer, let us take the case of a medium size mixer truck, the truck engine of which works most efficiently at 2800 r.p.m. In coming out of a pit, the first gear of the transmission should be used. The driver should stay in this gear until tachometer shows a 2800 r.p.m. reading when a shift should be made into second gear. Shifting into third gear should be postponed until engine picks up again to 2800 on the tachometer. Again with the tachometer controlling, a shift should be made into direct drive. Higher gears should only be used on clear highways.

Eliminate Harmful Practices

Whenever a driver of this type of equipment shifts into a higher gear before reaching 2800 r.p.m., in the present operating gear, he is committing a malpractice, commonly known as "lugging the motor." In all cases, if a driver gets into direct drive before he properly picks up a load, the engine is being strained and trouble is certain. Definite tachometer readings should also be followed in shifting from higher to lower gears.

"Lugging the motor" is a chief fault of many drivers. Lugging leads to broken top rings, burnt pistons and damaged ring lands. For the sake of better engine performance, keep admonishing your drivers, "Avoid shifting into higher speed too soon."

In taking off with their trucks, either empty or loaded, drivers should closely follow manufacturer's operating instructions. We and many other producers have failed to insist that these instructions be religiously followed. At the cost of added hours of economic life for their equipment, many drivers engage in harmful practices in getting their trucks underway. They use the wrong gear, improper clutch application and incorrect starting speed. Such harmful practices produce unnecessary strains that lead to gear clashing (destroying gear teeth) and clutch failures.

Handling our industry's heavy loads requires proper acceleration. Fuel is wasted and the engine is abused, unless the unit is controlled under steady acceleration. Pumping of the accelerator should be avoided. If the engine does not respond properly to steady acceleration, the governor may need adjusting or perhaps the brakes are dragging. Any development of engine noises during proper acceleration should also be promptly reported.

The engine should be operated in the gear ratio range which shows the best response to acceleration. Each gear combination provides a different speed ratio between the engine and the rear wheels. To move efficiently from one gear ratio to another, gear teeth should come into contact at properly watched speeds. Each driver should know his own truck so well that he is able to shift gears with a mimimum of gear clashing. With gear teeth worn or chipped, the problem of jumping out of gear naturally develops.

Drivers of mixer trucks should keep a close watch on performance and operating condition of front wheels. To obtain maximum, legal payloads, considerable weight has been thrown up front. Necessarily, rough treatment of the front wheels must be avoided. If the axle beam, knuckles or arms get bent, a lot of front end troubles will develop in a hurry. Drivers should regularly check truck alignment and tire condition.

Truck mixers, mounted on tandems, must be properly positioned. The front axle should carry at least 20 percent of the load. Especially on turns, if not enough weight has been put up front, steering on the road will be difficult. If front axles are carrying too much weight, front wheels will dig in when travelling over soft ground.

Mixer drivers should be cautioned on operating their units around curves. Truck mixers, handling live, shifting loads, are unwieldly and have a high center of gravity. Curves should be taken with great care, at reduced speed.

An efficient driver knows at what speed to operate his truck on the highway. Here we are referring to proper cruising speed. The accelerator should be kept in a position corresponding to about 70 percent of full torque. At this comparatively high speed range, the engine is most responsive to the accelerator; the torque builds up rapidly with the opening of the throttle. Whenever possible, in going up small inclines, momentum of the truck should be intelligently used to avoid shifting into lower gear. Coasting downhill with gear in neutral or clutch released should never be attempted. In going down hills, the unit should be held back to the maximum governed speed in that gear ratio. If he has clear sailing as the bottom of the hill is reached, a driver can use the last part of the grade in helping to accelerate again into higher gear.

The governor is put on a truck to limit the maximum speed of the engine. The governor, by controlling top engine r.p.m., saves maintenance. If engine speed is excessive, high loads on bearings and rods will cause premature wearing, parts will overheat and lubricating oil will deteriorate. The governor functions whether the truck is pulling out of a hole, climbing a hill or travelling on a level road. Too few drivers realize that engine speed in low gear off-the-road pulling at 10 m.p.h. is equivalent to the engine speed of a passenger car travelling 90 m.p.h. on a highway. On tough off-the-road pulling, the governor cuts in whenever the motor is being pushed or strained. Functioning in all kinds of operating conditions, the governor's job is to prevent engine abuses.

Axle breaking is a principal delivery headache of our industry. Too many job's conditions are conducive to axle breaking. To eliminate this problem, we've got to stop drivers from abusing our trucks. An axle doesn't often collapse from one shock, but rather from a series of shocks. An axle shaft will generally twist ¼ to a full turn before it lets go. One tough shock may take 15 to 25 percent out of the life of an axle. The jarring around, sustained while the truck is returning light, will add to the damage. After a combination of events, one severe shock ends all.

Stop axle breaking by taking these steps: (1) purchase axles of correct size and proper quality; (2) make periodic examinations of axles; (3) correct faulty clutch action; (4) make proper wheel-bearing adjustments; (5) carefully instruct drivers on off-the-road hauling; (6) insist that drivers correctly use auxiliary transmissions; (7) get rid of axle-breaking drivers (Drivers must know how to use the tools or else will ruin the equipment); and (8) aggressively seek contractors' cooperation in improving job ground conditions.

The delivery point is a place where many mixer trucks take a real beating. Few contractors give proper attention to the problem of job access. Some job conditions are so rugged, that even a tank would have difficulty in reaching the point where customers expect a mixer truck to go. After exposure to a number of bad job conditions, coupled with handling by an incompetent, careless driver, a mixer truck is likely to have a short economic operating life. Frames will be twisted, axles and springs broken, clutches shot, transmissions ruined and tires cut to ribbons.

In facing up to the problem of job conditions, efficient producers buy the right kind of trucks, employ competent drivers, instruct drivers to "play it safe," check jobs first when weather points to bad ground conditions, or when a contractor with a poor access record is involved, use two-way radios

(Continued on page 154)

When increased demand makes plant expansion necessary...

design with Fanning-Schuett

CORSON CONCRETE COMPANY, Plymouth Meeting, Pa., is expanding its plant with an additional large storage bin and an additional mixer and batching facilities to meet the expanded demand for central mix in the Plymouth Meeting - Norristown area. The present belt conveyor will serve both storage bins by the addition of a short return belt conveyor for the second bin. Another Fanning-Schuett plant addition.

The problem of providing enough cement and concrete for the tremendous building program of our ever-growing economy has focused attention on the need for plant expansion. All over the country concrete plants are turning to Fanning-Schuett for economical additions to existing facilities.

For new plants as well as these expansions, there is a good reason for designing with Fanning-Schuett. Almost a half-century of experience has given Fanning-Schuett a "know-how" which means top efficiency in cement and concrete handling and storage equipment.

MAINE CEMENT PRODUCTS COMPANY, INC., Portland, Maine. A complete new plant is being designed and built for this rapidly growing company to produce concrete blocks and other products for the Home Building Program. Included in the plant are five storage bins for aggregates; one storage bin for cement; and handling equipment such as machinery for handling cement, screw and belt conveyors and two elevators.

FANNING-SCHUETT JOBS IN PROGRESS

STEPHEN'S REDI-MIX CONCRETE CO., Winter Haven, Fla. The demand for concrete has increased in this area to the extent that this company has found it necessary to install additional aggregate handling equipment consisting of elevators and conveyors and, also, a large capacity storage bin for bulk cement together with an elevator and screw conveyor to handle the new bin. Another Fanning-Schuett plant expansion job!

BOREE CONCRETE BLOCK CO., Jacksonville, Fla. This block company in the ever-growing City of Jacksonville is keeping pace with the demand for increased output by adding storage bins and batching equipment in conjunction with the block making machinery.

LAVINO SHIPPING CO., Philadelphia, Penna. We are presently installing truck loading facilities and storage bins for handling iron ore at this company's Wilmington and Camden Marine Terminals.

DELVAN BLOCK COMPANY, South Williamsport, Penna. To increase its output of concrete blocks, this company is adding a new mixer, and additional storage bins and batching equipment.

SUPERIOR BLOCK CO., Winter Haven, Fla. This growing company in the concrete block and products business is installing a storage bin and machinery for bulk cement with a capacity of over 600 barrels. All Fanning-Schuett equipment.

FANNING-SCHUETT ENGINEERING COMPANY
4325-39 NORTH THIRD STREET PHILADELPHIA-PENNSYLVANIA

Left: Reinforced concrete masonry house with units made with expanded shale aggregate, located 4700 ft. from ground zero, as it looked before the atomic explosion. **Right:** View after the blast. Inspection showed masonry units to be in good condition. There were a few hairline cracks. Although glass and venetian blinds were blown out, the contents of the house were well protected. The house was vertically reinforced with ½-in. steel rods, 32 in. apart, and was on a flat slab foundation with thickened edge to form a beam around the perimeter

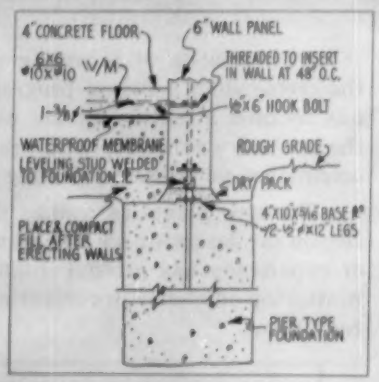
Concrete Houses Survive Atomic Blast

PHOTOGRAPHS ILLUSTRATING THIS ARTICLE are remarkable proof that concrete must be given serious attention in building residences, schools and other buildings that will provide protection from an atomic blast. They show that an expanded clay or shale aggregate concrete house, when built either of reinforced masonry units, precast slabs, or a combination of both, can offer much of the security that a specially built bomb shelter can, if such houses be properly designed and built. This conclusion came out of the Civil Defense "Survival City" nuclear tests May 5 at Yucca Flats, Nev.

Among a number of residential structures of various types of materials subjected to that atomic explosion, there were four houses built of expanded clay and shale concrete. Two were of concrete masonry units and two more of reinforced precast slabs and panels.

One of each of these two types of houses was located, with others of different materials, just 4700 ft. from the point of explosion, and another of each type was 10,500 ft. from ground zero. The explosive force was equivalent to that from blasting 35,000 tons of TNT, producing a shock wave equal to a wind velocity of 400-450 m.p.h., or a lateral pressure of up to 720 lb. per sq. ft. at the 4700-ft. mark.

All four concrete houses performed far better than expected and none of them suffered appreciable structural damage. Those at the 4700-ft. line were the only houses left standing after the blast and they suffered only slightly cracked walls and damage to windows and doors. Those at the 10,500-ft. mark had no structural damage at all.



Section through wall at pier foundation of precast concrete house

Companies Cooperate

Private industry cooperated in the test as a contribution to the Civil Defense program. Participating companies which shared the expense of erecting the concrete houses were Basalt Rock Co., Inc., Napa, Calif.; Buildex, Inc., Ottawa, Kans.; The South Dakota Lightweight Aggregate Co., Rapid City, S. D.; Rocklite Products, Ventura, Calif.; and Texas Industries, Inc., Dallas, Texas.

Cedric Willson, vice-president of Texas Industries, Inc., Jack Streblow of Basalt Rock Co., Inc., and E. A. Peterson, Rocklite Products, served as project consultants with Eugene F. Henry, Basalt Rock Co., Inc., serving as an assistant project officer.

Shale and clay aggregate were shipped from plants of Texas Industries to the plants of Rocklite Products and Basalt Rock Co. in California where the masonry units and precast slabs were manufactured. About half of the

Left: Reinforced precast concrete house 4700 ft. from ground zero, as it looked before the blast. The units were made with expanded shale aggregate. **Right:** View of house, made with reinforced lightweight concrete slabs and panels, after the explosion. This house suffered only slight chipping in two corners inside the house and at three connections between the roof and outside garage wall

• Lightweight aggregate masonry and precast houses of earthquake-resisting design withstood atomic shock equal to wind pressure of 720 lb. per sq. ft.

By BROR NORDBERG

8- x 8- x 16-in. units for the two masonry houses were Texcrete (Texas Industries) units and the rest were Rocklite units. All units complied with A.S.T.M. Specification C-90-52, for Grade A, Hollow Load-Bearing Concrete Masonry Units. Actual average compressive strength of the units for the test houses was 1300 p.s.i.

Half of the slabs for the walls of the precast concrete houses were of Haydite expanded shale aggregate (Texas) and the other half were of Basalite expanded clay aggregate (Basalt Rock Co.). Test cylinders made at the Napa plant had an average compressive strength of 3200 p.s.i.

Houses built for the test were one story, four room and bath units of about 1000 sq. ft. of living space, and construction followed standard West Coast earthquake resistance code design building practice. The precast house was a standard model designed by Basalt Rock Co. (see ROCK PRODUCTS, January, 1954), which sells for about $10,000 on the average lot in California.

Design Features

The flat over-hanging roofs of all the concrete houses were of 6-in. reinforced lightweight slab construction weighing about 45 lb. per sq. ft. which possibly was a factor in successfully withstanding the blast. Partitions in the houses were 8-in. lightweight concrete units in the masonry houses, and 6-in. panels in the precast houses, which also had 6-in. outside walls.

Details of the houses were of standard construction, reinforced to comply with California earthquake require-

Right, top to bottom: Sequence views of reinforced concrete masonry house, part of "Survival City," Yucca Flats, Nev., atomic blast test. The house was located 4700 ft. from ground zero. In top view, the house is illuminated by the intense flash; in center view, the heat of blast hits the structure and waves of smoke seem to vibrate from the TV antenna on the roof; in bottom view, the blast passes over the electronic and communications building, blowing out windows and knocking down TV antenna. Photos were made with AEC automatic cameras

FAST PRODUCTION TEAM for off-road hauling . . .

You get high-speed production on both excavating and hauling when you team Koehring fast-shuttling Dumptors with Koehring heavy-duty shovels. Notice on the loading operation, above, how Dumptor spots in close — keeps shovel swing short. Square body opening provides a big, easy-loading target — can be loaded over either end, or from the sides.

On the haul, Dumptor travels round trip without turning, has the same fast speeds in either direction. This eliminates at least 2 slow turns every round trip — often saves as much as 30 seconds on every cycle. What's more, 1-second gravity-dump saves more time on every trip — and, gravity-dump never balks, never wears out. This Koehring 6-yard heavy-duty hauler also has better than 6 h.p. for every ton of loaded weight. It accelerates fast, pulls through soft ground and up steep grades with less shifting, climbs 24% ramps or grades fully loaded.

Now, take a quick look at the other half of this heavy-duty team — the Koehring ¾-yard 304 shovel. Its powerful digging crowd is backed by plenty of weight-stability to hold solidly to the grade. Automatic take-up and release of tension on crowd chain assure maximum dig-in power at every boom angle. Powerful 304 booster clutch requires only ⅓ to ½ the lever pull of a straight manual clutch, yet retains accurate "feel" of load. Instant dipper-trip that works every *time* is another Koehring feature that steps up shovel cycles, and increases daily yardage output.

This Koehring 304 is readily convertible from shovel to ¾-yard hoe, big-capacity clamshell, dragline, or lift crane. As a crawler-mounted crane, it has 13.9 ton lift capacity — and 25-ton lift capacity on rubber-tired truck or cruiser mounting. 4 other models in the Koehring heavy-duty line offer you a complete range of sizes.

ideas

for low-cost handling of aggregates and cement

Water Batchers
give close quality control of concrete. Semi- or full-automatic. 120 and 240-gal. capacities.

Cement Batchers
6 sizes from 10 to 38 cu. ft. Scale capacities from 700 to 3000 lbs. Semi- or full-automatic controls.

Single-Material Batcher
properly sized for 1¼ cu. yd. batch, 2560-lb. beam capacity for stone — 1520-lb. beam capacity for sand.

Batcher Test Weights
available in sets of nine 50-lb. calibrated units, and two 25-lb. steel hangers. Assure accurate weigh-batching.

Yard Bin
is ideal for loading trucks where no batcher is required. 9-ft. clearance under discharge gate. Holds 35 cu. yds.

Elevator Buckets, Chains
2 types, 7 sizes of buckets for aggregates and cement. Johnson long-life steel chain has carburized knuckles.

Chain Sprockets
19-tooth, chilled-rim cast iron with heavy split hub, double-rim lugs. Also, 12-tooth cast-chrome manganese.

Elevator Safety Cage
Johnson ladder safety cage, welded to elevator casing, is 28 inches in diameter. Costs only a few dollars per foot.

Clamshell Buckets
all-welded, smooth inside and out. Fast-filling, easy closing. Manganese cutting edge. 3 types, 10 sizes, ⅜ to 3 yds.

Concrete Buckets
3 types: Finger-Tip Control in ½ to 2 cu. yd. sizes; 1 to 4 cu. yd. Johnson-Drava; and 2 to 8-yd. Lo-Slump buckets.

Little Titan Scale
accurately weighs loaded barrows. Has one, two or three 500-lb. weigh-beams. Light — 2 men can carry.

. heavy-duty digging

Consider what this combination of Koehring excavators and Koehring Dumptors can mean to you in overall operating efficiency, economy — and in time-saving convenience when you standardize on one make of equipment for all of your excavating and hauling. Get more complete information on Dumptors®, and on the 5 sizes of Koehring excavators from your Koehring distributor. Call him today for all the facts — or write us for catalogs.

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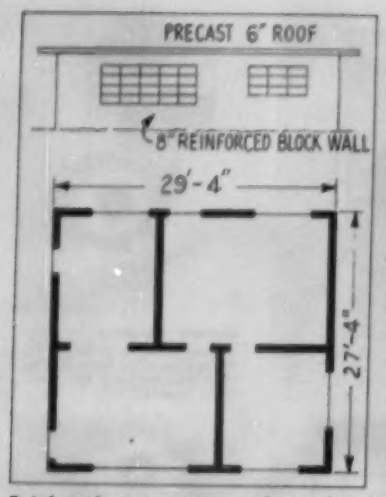


Reinforced concrete masonry house showing elevation and floor plan

ments as set forth by the Pacific Coast Building Code.

The masonry house was vertically reinforced as stipulated by the code (see accompanying detail drawing), having ½-in. round vertical reinforcing rods spaced on 32-in. centers in the 8-in. exterior and interior walls, and reinforced horizontally with two ½-in. bars in bond beams continuous at top of wall and bottom of windows in both exterior and interior walls. This was in addition to horizontal reinforcing. Partition walls were also reinforced to take the stress, should the windows be blown out, that would otherwise be withstood by the exterior walls. The roof was tied to the external walls by reinforcing to form a rigid framework, positively tied, as a single unit. Masonry houses were on a flat slab foundation which had a thickened, reinforced edge forming a beam around the perimeter.

The precast house was on a foundation of drilled piers, the tops of which were 14 in. below the level of the finished floor. Wall and partition panels were placed directly on the piers so that the slabs themselves functioned as beams. After the walls were set on the piers, a 10-in. sand fill was placed inside the rooms and a 4-in. reinforced concrete floor superimposed. The floor slab was anchored to the walls by means of hook bolts in inserts previously set in walls.

Results of Blast

Force of the explosion destroyed houses of other types, wrecked industrial buildings, twisted and overturned vehicles and crumbled utility structures.

The following report on the damage to houses is quoted from an official release by the Federal Civil Defense Administration:

"The above ground portion of the two-story brick and cinder block house located 4700 ft. from the explosion was almost completely destroyed, and the first floor system was partially collapsed into the basement. None of the brick work remained standing, and the structure as a whole was beyond repair even for emergency shelter from the elements.

"The one-story frame rambler located near the 2-story brick dwelling 4700 ft. from the explosion was likewise almost completely destroyed. Only the reinforced concrete bathroom shelter remained intact. Both the one-story reinforced lightweight expanded shale concrete block house and the one-story precast lightweight concrete house suffered only minor structural damage. These houses were also located 4700 ft. from the explosion. With the replacement of doors and window sash, both houses could be made habitable.

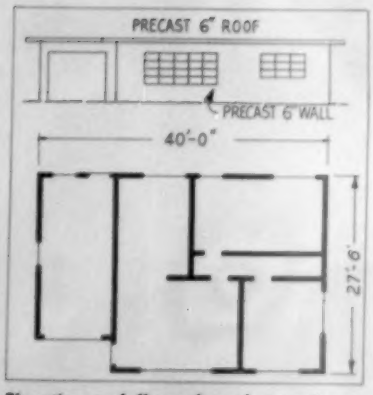
"At 5500 ft. from the explosion the 2-story redesigned frame house suffered severe damage, and would not be suitable for occupancy without extensive major repairs which would hardly be economically advisable.

"The one-story precast lightweight aggregate concrete house and the one-story reinforced masonry block house, both located 10,500 ft. from the explosion, suffered relatively minor damage. Only minor repairs would be required to make these dwellings suitable for reoccupancy.

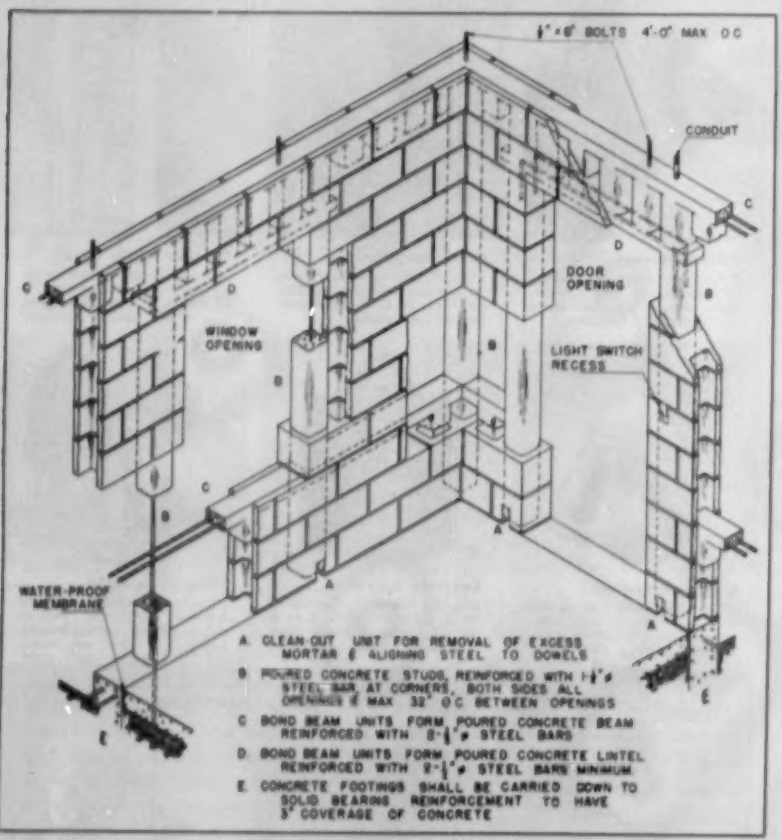
"The one-story frame rambler, also located 10,500 ft. from the explosion, suffered relatively heavy damage, but nevertheless could be restored to conditions suitable for occupancy at moderate costs."

Principal damage to the two concrete houses at the 4700-ft. distance consisted of the blowing out of the

(Continued on page 153)



Elevation and floor plan of precast, expanded shale concrete house


CONDUIT
DOOR OPENING
WINDOW OPENING
LIGHT SWITCH RECESS
WATER-PROOF MEMBRANE
A CLEAN-OUT UNIT FOR REMOVAL OF EXCESS MORTAR & ALIGNING STEEL TO DOWELS
B POURED CONCRETE STUDS, REINFORCED WITH 1-½" ø STEEL BAR AT CORNERS, BOTH SIDES ALL OPENINGS & MAX 32" OC BETWEEN OPENINGS
C BOND BEAM UNITS FORM POURED CONCRETE BEAM REINFORCED WITH 2-½" ø STEEL BARS
D BOND BEAM UNITS FORM POURED CONCRETE LINTEL REINFORCED WITH 2-½" ø STEEL BARS MINIMUM
E CONCRETE FOOTINGS SHALL BE CARRIED DOWN TO SOLID BEARING REINFORCEMENT TO HAVE 3" COVERAGE OF CONCRETE

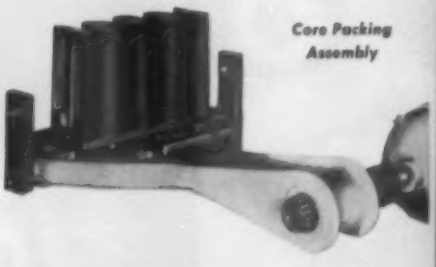
Detail sheet for 8-in. reinforced bearing walls of type used for atomic blast test house

Only Korpak has 3-Way Packing

Density determines quality . . . and packing determines density. No block machine has such packing thoroughness as the Korpak. Why?

Because the cores, instead of serving only to form the voids, are put to work as active densifying agents. Under direct-connected motor power, they move back and forth 3600 times a minute, with each stroke serving to pack incoming material laterally against the mold box sides.

Lateral packing from around 300 square inches of packing area is augmented by the upward pressure, with the amount of squeeze adjusted to fit the kind of aggregate being used. 1-man operation . . . hydraulic movements . . . electrical controls. 2¼ tons of machine self-contained to occupy only 33 square feet of floor space. Available on sale or lease-purchase.



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BUILDER OF CONCRETE PRODUCTS MACHINERY SINCE 1904

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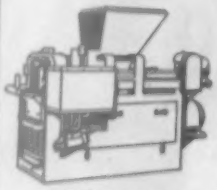
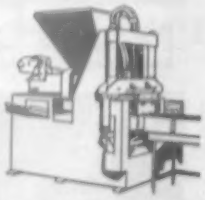
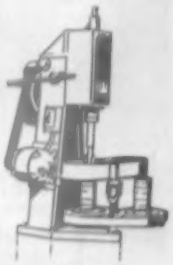


HYDRO-KORPAK BLOCK MACHINE



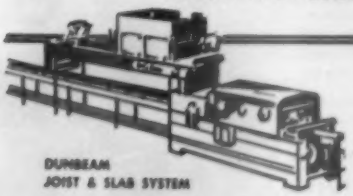
TWIN-PAK BLOCK MACHINE



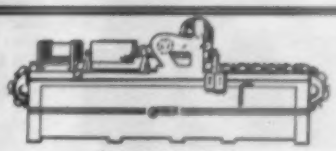
CHAMPION DRAIN TILE MACHINE

DUNN "AUTOMATIC" DRAIN TILE MACHINE

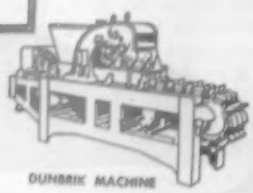
DUNTILE MACHINE



DUNBEAM JOIST & SLAB SYSTEM



CAVITEX MACHINE



DUNBRIK MACHINE

BESSER

★ This is the 120th of a series of ads featuring leaders of the Concrete Products Industry who are stepping up block production with Besser Vibrapac machines.

The VIBRAPAC Produces the HIGHEST Number of QUALITY Block at the LOWEST Cost!

The Belot Concrete Block Company, Tiltonsville, Ohio, are old timers in the block business. Back in 1919, they produced block by hand, and it wasn't until 1941 that the company installed their first Besser machine, a Champion 16-12 model. Today, they operate a modern VIBRAPAC, with all speed-up improvements, including height and density control.

Why did Belot specify Besser equipment? In the words of President J. R. Belot: *"We wanted a machine that would produce the highest number of quality block at the lowest cost"*. The VIBRAPAC does all that and does it with a minimum of downtime.

Just stop to reflect for a moment. Can you think of any other block machine in the world that comes up to the high standards set by a Besser VIBRAPAC?

BESSER COMPANY • Box 135, Alpena, Mich., U.S.A.
Complete Equipment for Concrete Block Plants

Belot Concrete Block Company executives: (left to right) L. R. Roberts, Sec. and Treas.; J. R. Belot, President; Barney Cross, Plant Superintendent.

Besser VIBRAPAC in the Belot plant. Fully automatic. No machine operator is required. Off-bearer is transferring three 8 x 8 x 16 modular units to rack, ready for the curing room.

Cubing block at Belot plant. No manual lifting. Workman uses Besser Hoist with Combination Clamp for transferring block from rack to cube. Note turntable for rotating rack. Another Besser time-saver.

Aerial view of the spacious Belot plant. Note large stock piles of block in all types and sizes, including Soffit Floor Filler units and Bes-Stone Split Block.

Ranch-type home built for Carl Bachman, a former U.S. Congressman. All masonry units are cinder block, produced in the Belot plant.

A 8359.1PBC

• American Concrete Agricultural Pipe Association held its annual convention in Denver, Colo., May 5 to 7. Papers presented on irrigation and drainage, concrete mixes. Discuss A.S.T.M. specifications for reinforced concrete, low-head pressure pipe

Dr. R. C. Mielenz, Bureau of Reclamation, Denver, Colo., showing types of concrete and aggregates to convention visitors. Left to right: Dr. Mielenz; Prof. A. F. Pillsbury, U.C.L.A.; E. C. Wenger, Portland Cement Association, Chicago; Don Cerven and Wm. Slaughter, Grand Island, Nebr.; and L. H. Tuthill, Bureau of Reclamation

Agricultural Pipe Convention In Denver

THE FIFTH ANNUAL CONVENTION of the American Concrete Agricultural Pipe Association brought 50 delegates from the West, the Southwest and the Midwest to Denver, Colo., on May 5 to 7. Papers on irrigation and drainage were presented by two members of the U. S. Bureau of Reclamation in Denver, and two university professors. A tour of the Bureau of Reclamation's soil and concrete laboratories was also made by members and guests.

Officers re-elected for the coming year were: A. M. Herman, Concrete Conduit Co., Colton, Calif., president; Harry B. Tellyer, Tellyer Concrete Pipe Co., Albuquerque, N. M., vice-president; George F. Lillie, Platte Valley Cement Tile Manufacturing Co., Scottsbluff, Neb., secretary; and Wm. B. Freeman, Lock Joint Pipe Co., Denver, treasurer. Homer Peterson, Rocklite Silo, Inc., Hutchinson, Minn., was elected a vice-president.

Directors re-elected were G. D. Williamson, Valley Concrete Pipe and Products Co., Yuba City, Calif., and Earl H. Eby, Elk River Concrete Products, Helena, Mont. A newly-elected director was Bruce N. Spencer, Jr., Gifford-Hill-Western, Inc., Dallas, Texas.

The convention opened with a joint meeting of the board of directors, the Technical Problems Committee, and personnel from the Bureau of Reclamation, including Frank E. Rippon, chief, canals branch, Pete Terrell, assistant chief, and Howard Curtis, head, canals and pipelines section. Lewis H. Tuthill, concrete engineer, offered an additional viewpoint. Among the subjects discussed were the preparation of an irrigation and drainage handbook, the new A.S.T.M. Tentative Specification for Reinforced-Concrete Low-Head Pressure Pipe, and the drain tile testing program now in use in Minnesota.

The following day Robert F. Adams, materials engineer, Bureau of Reclamation, spoke on "Concrete Mixes for Concrete Pipe." He discussed aggregates, pozzolans and retarders, referring to recent studies of these materials made by the Bureau of Reclamation. Mr. Adams also discussed control of mixes and presented some interesting statistical figures on the required *average* strength of concrete in order for a specified percentage of the specimens to have a certain *minimum* strength.

Charles R. Maierhofer, drainage and groundwater engineer, Bureau of Reclamation, talked on various aspects of drainage throughout the world. His slides were gathered from many countries where civilizations had ceased to prosper or even exist chiefly because of poor drainage practices. He discussed differences between drainage practices in the humid areas and in the West, pointing out that in the former areas, drainage removes rain and ground water accumulations, with the tile placed at a maximum depth of about 4 ft., whereas in the West the tile is used to remove excess irrigation water and salt accumulations and is placed at depths of from 6 to 15 ft.

Prof. Phillip W. Manson, University of Minnesota, discussed the Min-

(Continued on page 152)

Board of Directors and officers of the American Concrete Agricultural Pipe Association. Seated, left to right: Wm. B. Freeman, Lock Joint Pipe Co., treasurer; H. B. Tellyer, Tellyer Concrete Pipe Co., vice-president; A. M. Herman, Concrete Conduit Co., president; Homer Peterson, Rocklite Silo, Inc., vice-president. Standing, left to right: Bruce N. Spencer, Jr., Gifford-Hill-Western, Inc.; Geo. F. Lillie, Platte Valley Cement Tile Mfg. Co., secretary; G. D. Williamson, Valley Concrete Pipe & Products Co.; Earl H. Eby, Elk River Concrete Products Co. of Montana; and Howard F. Peckworth, man. dir.

Your Customers will say...

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Here you have a choice of 18 shades —6 Reds, 3 Greens, 3 Browns, 3 Yellows, 1 Black, 1 Blue, and 1 Orange. Each shade is manufactured to meet the most exacting specifications for cement work—as recommended by the American Concrete Institute and the Portland Cement Association.

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Here you have a choice of 5 different shades — one shade in double strength red, light buff, dark buff, chocolate and black. Each of these colors may be used with excellent results with any standard mortar mix or with a ready-made Bricklayer's Cement.

Write today for color samples and complete technical information on how Williams Cement and Mortar Colors give you superior results. Address Dept. 10, C. K. Williams & Co., Easton, Pennsylvania.

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Unloading the second of four 9½- x 101-ft. autoclaves at Illinois Brick's Blue Island, Ill. block plant

Illinois Brick Goes to Autoclaves

ILLINOIS BRICK CO., Chicago, is installing a high pressure curing system at its four-machine block plant in Blue Island, Ill. Costing about $400,000, the installation includes four 9½- x 101-ft. Struthers Wells autoclaves and a 360-hp. Combustion Engineering boiler. Provision has been made for erecting a fifth curing unit in the future if the need arises. The first autoclave was delivered on May 11, and the fourth will arrive early in June. The new curing system is expected to be in operation by the end of July.

Each autoclave has a capacity of 28 company designed contour 114-block racks. The curing cycle will consist of a 3-hr. presetting period taking place in low pressure steam kilns, followed by a 12-hr. autoclaving cycle. Curing will occur at 150 p.s.i. and 360 deg. F. Based on two curing cycles per day, the daily output will exceed 25,000 block.

In line with the modernization program, Illinois Brick is replacing two of its four high capacity block machines with two Oswalt machines.

Steam for the autoclave system will be supplied by this boiler under construction, which will have a capacity of 30,000 p.s.i. per hour

Concrete Products Firm

CENTRAL CONCRETE PRODUCTS CO. has been established at Mt. Pleasant, Mich., by Ralph J. Fisher, Sr., Arthur J. Fisher, James O. Fisher, and Ralph J. Fisher, Jr., of the Fisher Sand and Gravel Co., Midland, Mich. The company also acquired the ready-mixed concrete division of George Hubscher & Son, and the sand and gravel firm owned by Robert Quinlan at Mt. Pleasant.

Completes 50th Year

SIBLEY CEMENT CO., Sibley, Iowa, has just completed its 50th year manufacturing concrete pipe and other concrete products. Sibley is one of the oldest members of the American Concrete Pipe Association, Chicago, Ill., having joined the association when it was first founded in 1907.

ZERO Slump in ZERO Weather

It takes a NORTHERN winter to separate the men from the boys . . . and it takes real low slump concrete to show the mixing and discharging ability of a truck mixer. Smith De Luxe Mixers are known for their ability to handle zero slump concrete at any time of the year . . . even in zero weather.

You know that low slump concrete resists flow. It doesn't slide down the discharge blades easily. The Smith Mixer makes the tough, low slump jobs easy. It is designed to handle the stiffest and stickiest low slump concrete, every month of the year regardless of weather. Smith Mixers are built in all sizes and are guaranteed to agitate their full rating according to Truck Mixer Bureau standards. Contact your nearby Smith distributor for literature.

THE T. L. SMITH COMPANY, 2885 N. 32nd St., Milwaukee 10, Wis., U.S.A.

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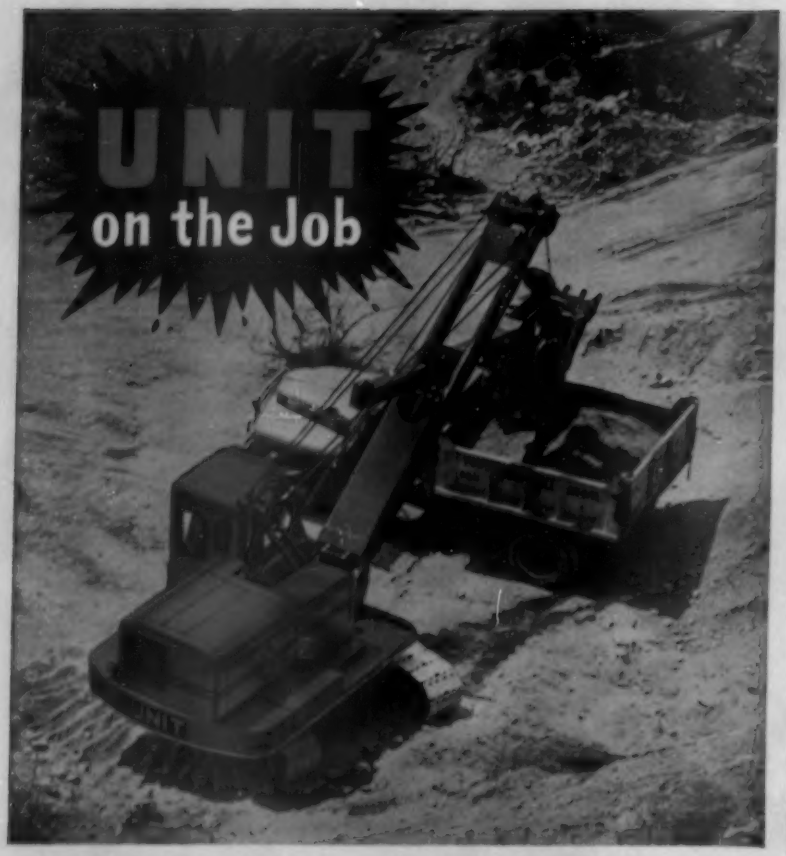

SWING SPEED makes PAY LOADS!

Here's a UNIT ½ Yard Shovel doing a PRODUCTION DIGGING JOB in a gravel pit. UNIT owners like the ease of operation and the FULL VISION CAB for complete visibility. They also like the sturdy construction and the many mechanical features, plus the ECONOMICAL PERFORMANCE and LOW UP-KEEP which all add up to EARNING POWER. Why not investigate what UNIT can do for you — on YOUR next excavating and material handling job?

SEE FOR YOURSELF: *Let us send you our novel TV Brochure. It illustrates the complete UNIT line.*

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UNIT

½ or ¾ YARD EXCAVATORS...CRANES UP TO 20 TONS CAPACITY
CRAWLER OR MOBILE MODELS . . . GASOLINE OR DIESEL

All Models Convertible to ALL Attachments!

Pipe Convention

(Continued from page 149)

nesota drain tile testing program, under which approximately 40,000,000 ft. of drain tile was installed in 1954. He described a program by which the Agricultural Conservation Program pays a farmer for part of his conservation drainage system being installed provided the tile used meets standard specifications. Tile is certified in the state by the agricultural engineering department of the university, in cooperation with the A.C.A.P.A., which tests four tile samples taken at random from the manufacturer's yard. The university then circulates to the Minnesota Soil Conservation Service and the Agricultural Stabilization and Conservation authority in the state a list of manufacturers producing at least "Standard Quality" tile; A.C.P. payments are authorized from this list.

Prof. A. F. Pillsbury, University of California at Los Angeles, presented a paper on "Concrete Pipe for Irrigation and Drainage." He told of some difficulties which had been experienced in irrigation lines due to wetting expansion and to surge. He described methods of preventing both sources of trouble, suggesting that the open type of system where surge was encountered be avoided in future designs even though systems have been developed to minimize its occurrence.

He also pointed out that drainage in irrigated agricultural areas principally involves controlling the depth of the water table to prevent the ground above from becoming too wet, to limit upward capillary water movement, and to prevent salt accumulations in root zones. He discussed the proper depth of tile, orientation, spacing, size, and grade of tile in considerable detail and remarked on tile joints, gravel envelopes, maintenance and leaching.

The board of directors decided to hold the 1956 annual meeting in Denver about the same time the 1955 meeting was held, with a supplementary meeting of the executive committee and interested members at a Midwest location in the late fall.

Prestressed Concrete Plant

ROCKWIN PRESTRESSED CONCRETE CORP., is building a new prestressed concrete products plant on a 5-acre site at Norwalk, Calif. The new enterprise site is the result of the combined efforts of Morris S. Pynoos, civil engineer and builder in the Los Angeles area, and Winthrop Rockefeller.

The fabrication will be done on 14- x 450-ft. casting beds, each capable of producing twenty four 50-ft. tapered concrete girders or 5000 sq. ft. of precast concrete roofs daily.

Atomic Blast Tests

(Continued from page 146)

window glass and exterior doors. The roofs remained intact and in their original locations.

In the block structure, the connections appeared to be intact and there was no evidence of misalignment or racking. Aside from the blowing out of exterior doors, a few steel window frames, and the breaking of window glass, there was some cracking that was confined to the mortar joints but there were no cracks through any of the block. Two lower courses under a 10-ft. window facing the blast were forced in 2 in. at the center, attributable to the fact that vertical reinforcing rods and concrete studs were not installed under this window as intended by the designer.

In the case of the precast house at 4700 ft. structural connections appeared to be sound. The metal door of the garage was blown into bits, all window glass was destroyed and the long outside wall of the garage had an outward bow deflection of ¾ in. There was some hairline cracking on the wall facing the blast but none exceeding $\frac{1}{8}$ in. At 10,500 ft., damage to both types of houses was far less.

Conclusions

Measurements of the shock wave indicated 5 p.s.i. "overpressure" at 4700 ft. and 1.7 p.s.i. at 10,500 ft., equivalent to a lateral load of 720 p.s.f. and 245 p.s.f., respectively. The design was for a wind load of 30 p.s.f. which would indicate that the concrete used could not absorb the entire load (over-pressure) imposed during the 0.75 second time duration of the shock wave.

There apparently is a mass and time relationship involved judging from the fact that frame structures did not fare too badly at the Tehachapi earthquake in California whereas, under atomic blasts, frame houses were reduced to kindling wood. Unreinforced structures of block or brick have little or no resistance to either earthquake or atomic shock. A positive and absolute diaphragm action, uniting the walls and roof into a single load-bearing structure, was the secret to success of the concrete houses in the atomic survival test.

It was learned from the test that it is possible to build concrete houses which can withstand the pressure of large atomic blasts within distances of less than a mile. Should residents of such houses survive the initial blast, they would be protected from the dangerous fall-out of radioactive material. Excellent protection from the blast itself may be expected unless the

(Continued on page 154)

PRE-MIX OPERATORS

...now you can handle jobs

MANY MILES AWAY!

6 AGITATOR

6 AGITATOR

DEMAND THE BADGE OF DEPENDABILITY

...with the new super

Hi-Lo agitator

CONCRETE TRANSPORT MIXER CO.

Made by the makers of the famous ROCKET Revolving Drum Truck Mixer

How many jobs have *you* missed—jobs just a little out of reach of your non-agitating equipment? Or how many times have you arrived on the job with a soupy, segregated mix? With the new, 6¼ cu. yd. *super Hi-Lo* agitator, you can make hauls that once were far out of range. Condition the mix as you go along—it's the same high quality when you pour as it is when it left your plant mixer.

Hi-Lo is probably the *least* expensive machine of its kind on the market. But more important, it is one of the least expensive machines to operate.

You see, the super Hi-Lo has a lot of sensible features that reduce maintenance, increase operating efficiency: Wide open top, replaceable liners of abrasion resisting steel, 180° swing chute with extension, sliding gate (no seal to replace), non-leaking, self-tightening packing glands, power takeoff, drive, replaceable blades and many others.

If you'll take a couple of minutes and send us the coupon, we'll show you how the new super Hi-Lo can be the key to higher profits for you!

MAIL THIS COUPON TODAY!

CONCRETE TRANSPORT MIXER CO.

4987 Fyler Ave., St. Louis 9, Mo.

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Gentlemen: Please rush full information, prices and terms on the following:

- ☐ New Super Hi-Lo Agitator (Model 625)
- ☐ Batching Equipment ☐ Water Meters
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NATIONAL Car Shaker

Patented

- Soon pays for itself
- Keeps your men out of R R cars
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Write for a list of users in your area

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Recognized Authority

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Minerals Industry

person happened to be standing in front of a window or door.

Results indicated that concrete houses of types built to withstand hurricanes and earthquakes may also serve as bomb shelters, under forces and distance conditions experienced in the test blast. Further studies by evaluation teams likely will show greatest safety to be in homes with basements or other type survival shelters.

California Block Association

CONCRETE MASONRY ASSOCIATION, a two-year-old organization of concrete block manufacturers in Southern California, elected the following officers for 1955: president, E. L. Chaffee, O'Kelley - Eccles Co., Baldwin Park; vice-president, Pete Muth, Orco Block Co., Stanton; secretary, H. C. Shirley, Superior Concrete Blocks, Temple City; and treasurer, Roy Beal, Roy Beal, Inc., El Monte. The directors elected were: R. F. Higgins, Hazard Block Co., San Diego; Leo Howard, Rio Hondo Dunstone, Montebello; T. N. Jamieson, Angelus Block Co., Burbank; retiring president E. P. Ripley, General Concrete Products, Van Nuys; and Mike Simovich, Chamco Blocks & Materials, Duarte.

The CMA, formed by the amalgamation of two similar associations, has been preparing a "Concrete Masonry Design Manual," which will be published in the near future; it will contain charts, tables, construction details and general information which an architect or engineer will need.

N.C.M.A. Convention

NATIONAL CONCRETE MASONRY ASSOCIATION, Chicago, Ill., announced that the 36th Annual Convention will be held at the Roosevelt Hotel in New Orleans, La., on January 23-25, 1956.

Preventive Maintenance

(Continued from page 140)

to maintain close contact with jobs and have an understanding with drivers that if they feel they can't get in, they will call the office.

On arrival at a job, the competent driver gets out of his truck and carefully studies ground conditions. He looks for holes, soft spots, depressions, objects in way, abandoned wells, unmarked septic sanks, hidden water lines, etc.

On some jobs, a driver may have a choice of going in forward or backing in; a choice of unloading first at one of several spots. A driver has better control over his truck when moving forward. Backing up is tougher because of lack of vision. When backing up, a driver should always get the assistance of a responsible job em-

ployе in helping him to guide the truck's movement.

On sandy soil, it is generally better to go forward. When backing up over sand, the front end tends to dig in. In moving over sandy soil, a driver should never attempt to make sharp turns. To avoid bogging down and prevent punishment to his truck, a driver should always take as wide a sweep as possible; otherwise, front wheels will dig in and the front wheels of the tandem will drag.

If there is a choice of two places to start unloading, a driver should pick the easier spot first. After the truck has been partially unloaded, a driver will have less trouble in reaching the tougher unloading point.

On rugged off-the-road pulling, a driver should go into low gear on both transmissions. The tandems should be interlocked or equalized. On interlock, all wheels drive together. A driver should always use interlock when ground is slippery — stops the one drive wheel from spinning. If stuck in interlock, a driver should pull slightly in opposite direction (old tracks will give added traction) then pull in intended direction. A word of caution: Admonish all drivers never to use interlock on the highway.

If ground is sticky, rather than soft, transmission should be kept in second gear with the motor "revved up;" the little extra speed will get a truck over a hump or other bad spots. A driver shouldn't take off the power and lose the momentum in going over the tough places. He should keep barreling through until he is on safe ground; and this doesn't mean misusing the truck.

Getting hung-up, then trying to get out is what ruins axles and gives the truck a beating. When stuck, "jumping" should be a forbidden maneuver. When hung-up on construction jobs, a driver sees to it that stone or some other material is thrown under the drive wheels to give the needed traction. A driver once told me that he broke an axle, in trying to get out, because no stone was available. Apparently, other key men in our organization and I had failed to tell the driver that a little concrete from inside the drum could be used in place of the missing stone. It is embarrassing how often the obvious is overlooked.

There are some uncooperative contractors on whose jobs, ground conditions are generally so bad that producers would be ahead if they passed up such business. There are some drivers of mixer trucks who abuse their equipment so badly that units handled by them have never made a dime for the ready-mixed concrete operators.

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W. B. Mount, Maymead Lime Co., Shouns, Tenn. says, "We averaged 127 cu. yds. hourly in one 9-hour day . . . averaged 1,273 tons daily in a 9-day operation, loading out stockpiled crusher run stone, with our one BANTAM shovel. Naturally, we are very proud of our BANTAM."

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M. D. Coslet, Casey Stone Co., Greenup, Ill. says, "We use our BANTAM crawler to load aggregate for State Motor Field Tax Roads & Townships, and find that the BANTAM outproduces other rigs, and is less expensive to operate and maintain. Our only problem is to keep enough trucks on the job to keep the BANTAM busy."

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It makes good dollar sense! Low initial cost . . . low operating cost . . . low upkeep and repair . . . that's the economy of owning a BANTAM! Remember, too, BANTAM'S work with 9 fast change attachments from shovel to clamshell, handling dozens of jobs! There's a BANTAM mounting that will fit your needs EXACTLY! BANTAMS mount on Crawlers . . . Crane Carriers . . . Self-Propelled Cruisers!

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RP-11

Punch Card Concrete Batching

(Continued from page 136)

the card reader pins against the contact buttons. The lower left hand corner of card is clipped, permitting "card interlock" pin to make contact.

A light will flash if the card is inserted properly. If any discharge lights remain on, the operator presses a "discharge close" button. If a light remains lit, indicating a gate to be not completely closed, the condition must be corrected.

In automatic operation, the "power on" button is first pressed and a pilot light will light. The operator then sets the moisture compensation control to the predetermined percentage. The proper card is inserted in the card reader, and the desired mix control button is pressed.

When the start button is pressed, the scales start to operate in sequence, the circuits tieing in the three weight systems for cement, aggregates and water. Sand, cement and water start feeding together. When the desired amounts of cement and sand and the moisture compensation are batched and the amount called for is applied to the coarse aggregate scale, the flow will stop. It is possible to select and introduce into the batch two of three types of cement and four of six types of aggregates.

Water is introduced through a main valve and then at slower rate through a butterfly valve. The clutch is engaged on the cement feed screw at high speed until the amount called in the control section is reached. Then follows the reduced feed sequence with the low-speed motor. When all sequences are completed, a "batch complete" light turns on. Discharge of all three scales is in a pre-set time sequence.

After the desired amount of each component is established, the operator must select the dry or wet sequence before discharging the hopper. For dry mix operation, pressing the "discharge open" button overrides the mixer interlock and energizes the water diverter. Once the start button is pressed, discharge cannot be made in the wet mix sequence unless the batch is complete, the mixer has been discharged and the diverter is in correct position. Any change of balances caused by residue in the hoppers, dirt on the levers, etc., can easily be corrected through manual adjustment.

Interlocks in the automatic operation sequence prevent adding material to the hoppers while the hopper gates are open, as indicated by lights. When desired to operate the batching plant manually, the power is turned on, energizing the cut out of automatic operation. Then the proper push buttons are pressed and the mechanical dial scales read. The operator must select the dry or wet mix.

One of the accompanying illustrations shows the manual switches for six aggregates and three cements to the left of the operator, who is shown inserting a punch card into the electronic reader. Also seen are the Bristol-recording instruments, scale dials, automatic Pozzolith dispenser control, timing device and various light signals. Upon completing the mixing which requires two minutes, the operator discharges the concrete by push button into the surge hopper below.

Purpose of adopting electronic control is to furnish instrumentation capable of high accuracy and repeatability, to relieve the operator of tiresome operations, and to eliminate human errors. Ordinary practice is to set up each batch as they come up, and the most common error is in the setting up of one or more ingredients on scales. The time required to change a complete batch in this plant is that required to insert the punched card.

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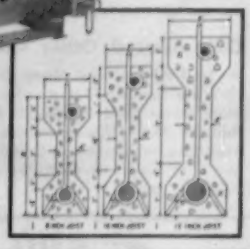

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Yield tests are made twice daily, and measurements of moisture in the sand are made several times daily by drying out samples and taking weights. Compressive strength tests are made once a week at each plant. Design basis is 27.3 c.f. per cu. yd. Series of compressive strength tests are made on the job, at intervals, and frequent check tests of the important concrete properties are made on the job, sometimes by independent laboratories.

Samples of sand for moisture determination are taken direct from the stream dropping into the sand hopper. Samples of concrete to be tested for strength, yield and slump are taken right out of the truck mixers.

Trucks

Cleveland Builders operates a fleet of 60 ready-mixed concrete trucks of which 35 are rated at 6-cu. yd. capacity as mixers and the balance are 5 cu. yd. capacity. Nearly all of them are high discharge units with tandem axles. Weight laws are very rigidly enforced in the Cleveland area, and the limitations are 19,000 lb. for front axle loading and 31,500 lb. for tandem rear ends.

The fleet is composed of various makes of chasses and mixer drums, mixers being Rex (29), Challenge (12), Smith (8), Jaeger (7) and Ransome (4) manufacture. Chasses are White (34), Mack (15), International (9) and Ford (2). In addition there is a 3½-cu. yd. Challenge mixer mounted on a White truck. They are painted a bright yellow with black lettering.

Thirty-four units are assigned to Plant "J" and the remainder to the two older transit-mix plants. Aggregates are supplied by truck from the new plant to the west side operation, whereas the other plant uses slag as coarse aggregate and sand from local pits.

Twenty-seven truck units have been equipped with 2-way Motorola radio, and the balance of the fleet will be so equipped. In addition three of the

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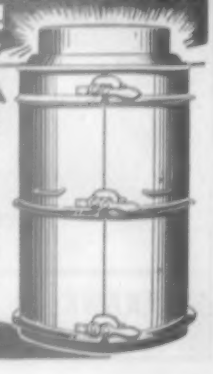

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service cars have 2-way radio. The main transmitter is atop Cleveland's Terminal Tower Building, and central dispatching headquarters are in the company's downtown main office. The system is effective for clear reception over a radius of 25 miles. Sending is on a frequency of 460.10 megacycles and receiving on 468.10 megacycles. Drivers receive their orders at the plant office as they circle office to the batching plant.

A wide variety of concrete mixes is produced, nearly all in the range of 3 to 5-in. slump and on a sack basis of proportioning. The price list quotes 60 standard prices as based on zones and according to quantities, for the various cement factors. Basing point for prices is the Public Square in downtown Cleveland. Separate prices cover quantities of 4 to 50 cu. yd. and orders exceeding 50 cu. yd., and one set of prices applies for 0 to 6 miles and a second for distances in excess of six miles to the Cuyahoga County line. Separate price lists apply for adjoining counties.

Premium prices are charged for less than 4-cu. yd. loads, also for the use of special sized aggregate, calcium chloride, Pozzolith and for high early strength and waterproof concrete. Saturday and late-in-the-day deliveries also carry a premium price as do Sunday and holiday orders. Prices quoted are for a normal discharge rate of ten minutes per cubic yard after arrival of a truck on the job. A demurrage charge of a flat figure per cu. yd. is charged for each 15 minutes thereafter.

McDowell Co., Inc., Cleveland, Ohio, was general contractor for the plant construction, and Wilbur, Watson & Associates were engineers. Great Lakes Dredge and Dock Co. built the wharf. Butler Bin Co. furnished the bins, batching equipment and related control devices including panels, bin level indicators, solenoid valves and other necessary handling equipment for batching.

W. T. Rossiter is chairman of the board of directors of The Cleveland Builders & Supply Co.; W. H. Crangle is president and general manager; J. D. Kling, vice-president and treasurer; and E. S. Barkwell is secretary.

Jay C. Ehle is vice-president in charge of operations for the company and C. J. French is chief engineer and in direct charge of the Ready Mixed Concrete Division. Ralph Rainartz is superintendent of the plant. Robert W. McCormick, field engineer, is in charge of quality control. Ralph Reiner is in charge of the Concrete Products Division, one of the nation's largest and most successful concrete masonry operations.

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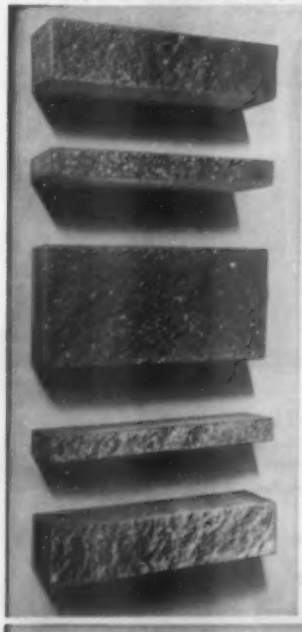

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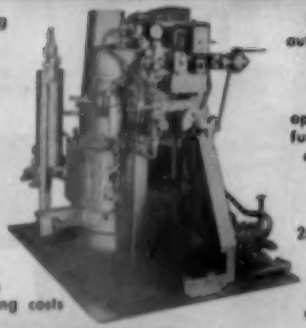

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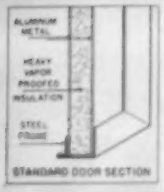

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Designed and built for maximum serviceability, the OSWALT Block Maker can operate at unusually high speeds. It insures top capacity for any given aggregate, and produces quality blocks in demand everywhere.

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Overhead Electric Crane for charging Mixer.
32—48 Block capacity Steel Racks.
1500—2" Wood Pallets.
1 Boiler, 6 Horsepower.

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COMPLETE BLOCK PLANT

Stearns #90, 2 block machine, automatic pallet return.
28 cu. ft. mixer.
Skip hoist.
50 racks.
2,200 pallets.
Fork truck with Schmidtgall hydraulic forks.
Electric automatic transporter with charger.
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With the following molds:

1—8x8x16 Regular Block with Accessories to make BN, Sash, Half, etc.

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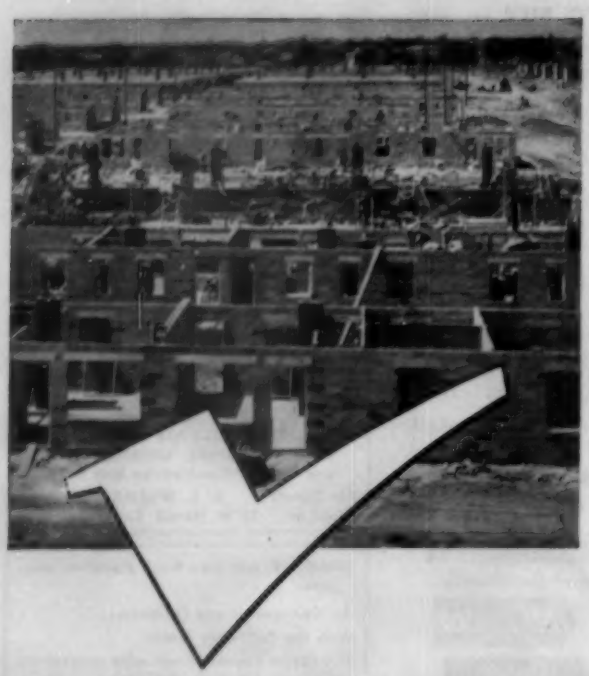

Check these construction practices to strengthen your market for

CONCRETE MASONRY

The first requisite for a successful concrete masonry business is making block that comply with applicable specifications for strength, dryness and absorption. However since your customers buy walls, not block, you can strengthen your market by making on-the-job inspections to promote quality construction. Use this check list:

1 See that concrete block stored on the job are protected from rain and snow.

2 See that tops of unfinished walls are covered each day to keep moisture out of cores in block.

3 Make sure that the masons do not pre-wet the block before applying mortar.

4 Discourage notching or cutting block around pipes, as this creates weak vertical sections.

5 Advise use of control joints to relieve stresses due to shrinkage and temperature changes.

6 Advise painters to let surface of caulking compound in control joints harden and then coat with shellac to prevent oils from bleeding through where portland cement base paint is to be used.

Send for free *"Concrete Masonry Handbook."* It is distributed only in the U.S. and Canada.

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Dept. A7-45, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of portland cement and concrete...through scientific research and engineering field work

INDEX TO ADVERTISERS IN THE CONCRETE PRODUCTS SECTION OF ROCK PRODUCTS

SEE INDEX OF ROCK PRODUCTS SECTION ADVERTISERS ON PAGES 173, 174

Allison Concrete Products 162

Berg Vault Co. 157
Bergen Machine & Tool Co., Inc. 127
Besser Company 129, 148, 159, 160
Blaw-Knox Company 128
Blue Ridge Talc Co., Inc. 162
Builders, Inc. 162
Butler Bin Co. 126

Cedar Rapids Block Co. 161
Cline-Thornton, Inc. 163
Colbeck's Concrete Co. 162
Columbia Machine 163, 165
Concrete Transport Mixer Co. 153
Concrete Weld Co. 163

Davis, Frank D., Co. 158
Dunn, W. E., Mfg. Co. 147
Dunn Masonry Machinery, Ltd. 147
Dura-O-waL Division 161

Erickson Power Lift Trucks, Inc. 160, 162

Fanning-Schuett Engineering Co. 141
Fulmore Concrete Block Co. 162
Franklin Concrete, Inc. 163

Gary Steel Supply Co. 162
General Sand & Stone Corp. 162
Gerson Co. 163

Johnson, C. S., Co. 144, 145

Kent Machine Co. 158
Kirk & Blum Mfg. Co. 156
Koehring Company 144, 145

Landers-Segal Color Co. 163
Littleford Bros., Inc. 160

Metropolitan Equipment Co. 163
Mid-Western Concrete Equipment Co. 162

National Conveyor & Supply Co. 154

Oswalt Engineering Service Corp. 162

Pallet Service Co. 162
Peters, L. L., Inc. 163
Portland Cement Association 164
Preco Chemical Corp. 161

Quinn Wire & Iron Works 157

Red-E-Mixed Concrete Co. 163
Rock Hill Concrete Co. 162

Schield Bantam Co. 155
Side-O-Matic Unloader Corp. 159
Smith Chemical & Color Co. 163
Smith, T. L., Co. 151
Southeast Ready-Mix 166
Spillman, R. L., Co. 163
Standard Dry Kiln Co. 160
Swadley, Steen 163

Travel Batcher 166

Unit Crane & Shovel Corp. 152
United Builders 163
United States Steel Corp. 124
Universal Atlas Cement Co. 124

White Motor Company 130
Willard Concrete Machinery Sales Co. 157
Williams, C. K., & Co. 150
Williams, Roger F. 156
Winnebago Cement Tile & Block Co. 162
Wittemann Machinery Co. 163

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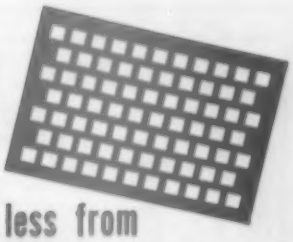

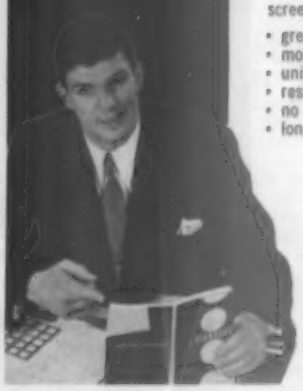

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Phone Montclair 3-5618

BONDED EQUIPMENT BARGAINS

WRITE, WIRE OR PHONE — IMMEDIATE SHIPMENT FROM OUR FACTORY

NEW BONDED® HEAVY DUTY VIBRATING SCREENS

"For Continuous, Economical Screening of High Tonnages"

More than 5000 mines and quarries have modernized with Bonded equipment

For mineral, chemical and other industrial products. Fast, efficient and economical for cleaning, sizing, grading, dewatering. Made in all metals including stainless steel. Enclosed models for hot materials or dust control. Bonded screens are built for any screening operation, wet or dry. **HEAVY DUTY MODELS:** 4-bearing, positive throw, eccentric shaft; 3'x8' to 5'x14', 1 to 5 decks. **TYPE A SCREENS:** eccentric weight mechanism, spring mounted, 1 to 3 decks, 2'x4' to 3'x8'.

Heavy Duty Screens from $1095.00 General Purpose Screens from $395.00

NEW BONDED® TROUGHING IDLER CONVEYOR BARGAINS

Complete Ready-Fab sections quickly and easily joined together on the job. We take our loss on our stock of short length belting. You can save as much as 50% on the BONDED CONVEYOR SPECIALS listed, with conveyor belting in two pieces. Conveyors are equipped with 5" roll diam. idlers and return rolls, 20" diam. head pulley and 16" diam. tail pulley mounted on 2¼" or 2-7/16" diam. shaft. Belt is new 4-ply, 28-oz. duck, ⅛" top rubber cover x 1/32" bottom cover and is fresh stock made by leading manufacturers.

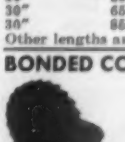
Remember, You Save Up To 50%

CONVEYOR PRICES INCLUDE BELTING

Belt Width	Length of Conveyor	List Price	Sale Price
14"	25'	$1080	$ 622
14"	50'	1830	985
16"	20'	991	548
16"	45'	1785	927
16"	60'	2309	1179
16"	85'	3102	1558
18"	25'	1229	684
18"	45'	1839	1005
18"	60'	2384	1254
18"	85'	3209	1665
18"	100'	3704	1912
20"	25'	1266	713
20"	45'	1965	1060
20"	60'	2490	1320
24"	25'	1322	773
24"	45'	2062	1145
24"	60'	2617	1434
24"	100'	4097	2166
24"	130'	5207	2773
30"	25'	1421	847
30"	65'	3101	1718
30"	85'	3731	2144

Other lengths and belt widths at bargain prices.

BONDED CONVEYOR ACCESSORIES



Holdback $90.00

Guide Idler $13.75

Wing Pulley $74.00

NEW CONVEYOR BELTING SAVE UP TO 28%

Heavy duty 4-ply, 28 oz. duck, ⅛" top rubber cover x 1/32" bottom cover rubber belting having high tensile strength, tough cotton duck, strong carcass and proper flexibility. For heavy boxes, bags and bulk materials. Troughs easily. Famous brands at deep cut prices. Fresh stock.

Width	List Price	Sale Price
14"	$3.23 foot	$2.50 foot
16"	3.64 foot	2.62 foot
18"	4.03 foot	2.90 foot
20"	4.42 foot	3.35 foot
24"	5.23 foot	3.76 foot
30"	6.39 foot	4.60 foot

Additional widths and plies available at low prices. Write for free sample.

NEW IDLERS AND RETURN ROLLS 25% BELOW LIST PRICE

3-roll, 5" diameter Troughing Idlers for

14" Belt..	$16.50	24" Belt..	$18.75
16" Belt..	17.25	30" Belt..	19.50
18" Belt..	18.00	36" Belt..	20.25
20" Belt..	18.25	48" Belt..	21.75

1-roll, 5" diameter Return Idlers for

14" Belt..	$ 6.38	24" Belt..	$ 7.50
16" Belt..	6.75	30" Belt..	8.25
18" Belt..	7.13	36" Belt..	8.75
20" Belt..	7.30	48" Belt..	10.25

All steel. Interchangeable with other well-known makes. Replaceable ball bearings. Either sealed type (pre-lubricated) or with alemite fittings. Rust proof ball races. Maintenance is negligible.

Visit the Bonded factory any time and see Bonded machines being built and tested. Consult our engineers without obligation. Write for free catalog and prices.

BONDED SCALE & MACHINE CO.

128 BELLVIEW, COLUMBUS 7, OHIO—PHONES: Hickory 4-2186; FRanklin 6-8898, Evenings

Mfrs. of Scales, Conveyors, Conveyor Parts, Idlers, Vibrating Screens, Crushers and Feeders

---

DEPENDABLE USED MACHINES

Special: Hough 1 yd. loader on Case pneumatic tired tractor; good condition—low price.

30x16 roll crusher	Pioneer-Mesabi 5x12 d.d. screen	Lorain ⅝ yd. dragline
16x16 roll crusher	Pioneer-Mesabi 4x16 d.d. screen	Link Belt ⅝ yd. crane
Butler ford truck	Universal 880 Diesel gravel plant	Koehring 1¼ yd. crane
40 ft. bucket elevator	Agricat tractor with angle dozer	Byers ½ yd. shovel
Eagle cinder crusher	Northwest ⅝ yd. truck crane	20 ton low trailer

These machines reconditioned in our newly-built daylight plant. Come see them.

10030 Southwest Highway TRACTOR & EQUIPMENT CO. Oak Lawn, Ill.

Quarry Equipment

Cedarapids 5240 5A primary unit. New condition.
Telsmith 18B gyratory 12" primary or secondary.
Cedarapids CCC 4024 roll crusher unit.
Cedarapids 4055 hammermill quarry unit.
Telsmith 9x36 jaw crusher.
Universal 3' x 12' feeder.
10x7 Allis-Chalmers Blake type jaw crusher. Rebuilt.
Cedarapids 4' x 14' double deck screen.
Tyler Ringura 3" x 12" triple deck screen.
15 cu. yd. Cedarapids sand drag. New.
60-ton, 2-comp., 5' x 15' storage bin w/clam gates.
Special bins to your specifications.
Conveyors—18"-24"-36"-30". Also belting.
19" dia. x 20" face magnetic pulley.

SHOVELS AND CRANES

Lorain 77, 1½-yd. diesel shovel. Good condition.
Brownhoist 1-yd. gas shovel-crane.
Lorain MC-414 20-ton truck crane.
Link-Belt LS85 diesel combination. Rebuilt.

TRACTORS, TRUCKS, SCRAPERS, ETC.

3—Euclid rear dumps, 22 ton. Good condition.
3—Cat DW 10 scrapers. Very good condition.
1—Int. TD9 w/front shovel attachment. Reconditioned.
Woolridge 15-18 yd. Model TCR scraper.

DIESEL POWER UNITS

Caterpillar D7700, 63 H.P. @ 1000 RPM. Rebuilt.
Caterpillar D13000 6-cyl. diesel engine, Twin Disc clutch, extended shaft, outboard bearing, 145 H.P. @ 1000 RPM. Rebuilt.
Caterpillar D17000 8-cyl. diesel engine with Twin Disc clutch, 190 H.P. @ 1000 RPM.
GMC 6-71 diesel engine radiator to and including clutch, 130 H.P. @ 1600 RPM constant duty, electric starting equipment. New condition.
GMC 12-cyl. twin diesel engine complete from radiator to and including automotive type clutch with gear reduction unit, fabricated base, electric starting system, 260 H.P. @ 1200 RPM. New condition.

LIFTING MAGNETS

3—40" Memco lifting magnets, used 2 months.

AIR COMPRESSORS

500 cu. ft. Gardner-Denver diesel, rebuilt.
865 cu. ft. Gardner-Denver diesel, rebuilt.

L. B. SMITH, INC.
CAMP HILL, PA.
Phone Harrisburg 7-3431

SURPLUS EQUIPMENT—WILL SACRIFICE

1—Used P. & H. Model 1055 Standard Shovel, 3½ Cu. Yd. Dipper, Caterpillar D-364 Diesel Engine. Parts & Tools. Good condition.
1—Used 75C Heiss Material Loader, Self-propelled, Gas Engine. Good Condition.
1—Used Bucyrus Armstrong, Model 29-T, Electric Churn Drill, Parts & Tools. Good condition.
1—Used Bucyrus Armstrong, Model 27-T, Electric Churn Drill, Parts & Tools. Good Condition.
1—New Bucyrus Erie, Model 12, Electric Bit Dresser, Combination 10-10A. Tools. Never used.
1—Used Bucyrus Armstrong No. 8 Electric Bit Dresser & Blower. Good Condition.

Big Rock Stone & Material Co.
Little Rock, Arkansas

DRYER & COOLER: Link Belt #606 Multi Louvre with accessory equipment.
DIESEL GENERATORS, Portable: 1000 H. P. and 500 H.P. For sale or rent.
COMPRESSORS: 1—Chicago Pneumatic 23x18x18, 625 H.P. and one 19x11x13, 185 H.P., type OCE, 440 volt. One Ingersoll Rand 29x18x21, 475 H.P. and one 23x14x 16, 300 H.P., type PRE, 2300 volts. All complete with auxiliary equipment.
PULVERIZERS: One 10½ ft. x 25 ft. Ball Mill, 450 H.P. motor, 2300 volts, 150 RPM. Hardinge Conical Mills 9'x36" and 8'x24", helical gears, speed reducers and motors.
MAGNETIC SEPARATORS: Dings 5 roll, 30" units, with gear head motor and M.G. set.
JAW CRUSHERS: Allis Chalmers 18x30", sectionalized for underground use, V-belt, 50 H.P. 220/440 volt motor, new condition. Also, 48x60, 42x40, 36x48", with or without motors and drives. Other sizes from 4"x6" to 48x60".
OVERHEAD ELECTRIC CRANES: 1—150 ton, 65' span, 220 volts, D.C., one 20 ton, 54' span, 220 volt, D.C. with M.G. set, and one 5 ton, 54' span, 4 motor, bucket operating, 440 volt A.C. Other cranes both A.C. and D.C. various spans, 5 tons to 55 tons, 3 and 4 motor.
LOCOMOTIVE CRANE: 25 ton capacity, standard gauge, gasoline powered, cast steel trucks, air brakes, with or without 1¼ yd. Williams clam shell bucket, thoroughly modern, excellent condition. Located Minnesota. For sale or rent.
LOCOMOTIVES: 2—65 ton diesel electric, standard gauge, thoroughly modern, excellent condition. For sale or rent.
MINE HOISTS: Single and double drum, 100 to 1500 H.P., with all electrical equipment. Complete specifications, drawings and photos available.
HOIST MOTORS:
300 H.P., 435 RPM. 600 H.P., 710 RPM.
400 H.P., 588 RPM. 1200 H.P., 444 RPM.
2200 volt, AC., with controls.

We Buy and Sell Equipment Throughout North and Central America

A. J. O'NEILL
LANSDOWNE, PA.
Phila. Phones: MAdison 3-8300—3-8301

3—10"x20" Champion Jaw Crushers.

1—Austin-Western Portable Plant—10" x 16" overhead eccentric Jaw Crusher, driven by 6 cylinder I.H. Gasoline Engine. Steel frame, wheels and draw bar.

1—Complete "Pioneer" Cinder or Slag Crushing and Screening Plant—10"x 20" crusher, 40"x22" rolls, D.D. 4'x12' screen, 4 belt conveyors, bucket elevator, two bins. All motors and drives. Near Philadelphia.

1—12" Enclosed Cent. Disc. Elevator, 78' centers with Motor. Heavy case.

30—Speed Reducers, 2 to 15 H. P.

1—New 3' x 5' Link-Belt U. P. Shake-out.

JOHNSON & HOEHLER, INC.
P. O. Box 102 Lansdowne, Pa.

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Available throughout the U.S. — Items you need may be available near you. Your inquiries would be appreciated.

Buildings	Derricks	Loaders	Pavers
Bins	Draglines	Locomotives	Rollers
Barges	Ditchers		Rail
Buckets	Dredges	Mixers	Scales
Belting	Drills	Motors	Screens
Cableways	Engines	Mills	Shacklines
Cars	Excavators	Machine-tools	Shovels
Compressors	Feeders		Tanks
	Graders	Pulverizers	Tractors
Conveyors	Generators	Pipe	Trailers
Crushers	Hoists	Pumps	Etc., Etc.
Dryers	Kilns		

(I can sell your surplus equipment)

ALEX T. McLEOD
MARIETTA, KANSAS

FOR VALUES — BUY BRILL

KILNS—DRYERS
1—9'x80' Allis Chalmers, ⅝" shell.
1—8'x125' Vulcan, ⅝" shell.
1—8'x70' Allis Chalmers, ⅝" shell.
1—7'x120' Vulcan, ⅝" shell.
2—6'x25', 6'x30', 6'x40' steam tube.
1—5'x67' Reeves, 5/16" shell.
1—5'x40' Cummer, ⅝" shell.
2—5'x30' Cummer, 7/16" shell.
1—5'x25' Allis Chalmers, 9/16" shell.
1—4'6"x50' Vulcan, ⅝" shell.
1—6'4"x24' Link Belt Roto-Louvre.

PULVERIZERS—MILLS
1—Raymond High Side Mill, 3 Roll.
2—Pennsylvania #8XR-100, 100 Ton per hour.
2—Hardinge 5'x22", 6'x22", 10'x48".
2—Patterson 6'x8' Ball Mills.
1—Raymond #40 Imp.
1—Williams #20 H.O. Slugger type Hammer Mill.
2—A.C. 6'x22' Tube Mills, 300 HP motors.
1—Allis Chalmers #8722 Compeb Mill.

CRUSHERS
2—Allis Chalmers 10" Superior McCully.
1—Allis Chalmers K-9 Gates Gyratory.
10—Jaw Crushers 8" x 6" to 42" x 48".
3—Symons Cone 4', 3', 2'.

SCREENS—SEPARATORS
6—Tyler Hummer Screens 3'x5', 4'x5', 4'x7', 4'x10', 5'x10', 4'x15'.
1—Link Belt 3'x8' double deck Screen.
5—Rotex 40"x84", 40"x120".
4—Air Separators 6', 8', 10', 14'.

OTHER ITEMS
2—Chicago 14"x7" Compressors, 434 cfm.
2—Oliver Rotary Dewaterers 8'x4'.
12—Bucket Elevators 20' to 75' centers.
250 ft. Link Belt 12" Troughing Conveyor.

PARTIAL LIST
Send Us Your Inquiries

BRILL EQUIPMENT COMPANY
2401-3 Third Ave., New York 51, N. Y.
Tel: Cypress 2-5703
OR
4101 San Jacinto Street, Houston 4, Texas

FOR SALE OR RENT

25 ton Ind. Brownhoist Diesel Loco. Crane.
30 ton Whitcomb Diesel Hydraulic Loco.
65 ton Porter Diesel-Elec. Loco.
30 yd. Western & Koppel Air Dump Cars.
100 HP Amer. 3D Elec. Hoist & Swinger.
25 ton American Steel Guy Derrick.
Koehring 1005 Diesel Crane 2½ yd. 1952.
P&H 655A Diesel Crane 1½ yd. 1952.
1250 cfm Ing. Rand PRE-2 Air Compr.
160 HP Caterpillar D-17000 Diesel Power Unit.

Mississippi Valley Equipment Co.
513 Locust Street St. Louis 1, Mo.

CRUSHERS—HAMMERMILLS

24"x36" & 48"x60" Traylor Bulldog Jaw.
2—20" Allis Chalmers Superior McCully.
1—54" x 24" Pioneer Crushing Rolls.
222R Allis Chalmers Hydro cone.
42x16, 36x16 & 30x16 crushing rolls.
36x24 Jeffrey B 75 hp, 440 V. Hammermill.
3000 Ft. New 42" Conveyor Belt.
1—42" x 900' Link-Belt Belt Conveyor.

LOCOMOTIVES & CRANES

15 ton diesel 60' Boom Whirley crane.
3—65 & 44 ton G.E. diesel elec. Locomotives.
10 ton Plymouth diesel locomotive.
4—125 Ton G.E. Diesel elec. locomotives.
25 ton Amer. Diesel Loco. Crane.

DARIEN, 60 E. 42nd St., N. Y. 17, N. Y.

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INDUSTRY TRENDS
THROUGH
ROCK PRODUCTS

ALSO SEE READY-MIXED CONCRETE AND CONCRETE PRODUCTS EQUIPMENT
WHERE TO BUY ADVERTISING IN CONCRETE PRODUCTS SECTION

MASSCO 4x6 Lab. jaw crusher
Acme Jaw Crusher 10x18
Climax Jaw Crusher 9x16
Climax Jaw Crusher 10x20
Champion 9x16, lever type jaw
Traylor 10x16 H Blake type crusher.
Pioneer 54x24 roll crusher
Sturtevant #0 rotary crusher 2 HP
Jeffrey 24x30 Flextooth Crusher with 40 HP motor, ring hammers
Allis-Chalmers R322 gyratory
Raymond #00 Imp Mills, Collectors
Bonded Scale 12x16 Cinder Rolls
American Clay Disintegrator 24" w.
Gravity roller conveyor 16"x150'
Gravity roller conveyor 24"x110'
1148 ft. 42" Conv. Belt (New)
425 ft. 42" 7 ply Used Conv. Belt
Enclosed Cont. Elevator 20"x75'
New & Used Elev. Buckets, all sizes
140' 6 ply 14" Elev. Belt (New)
500' #825 ley-bushed chain with att.
V Belt pulleys to 60" dia.
Hummer type 31 screen 6'x5'.
Link Belt P148 screen.
Hummer motor-generator sets.
75 assorted gearmotors to 20 HP.
18 Link Belt Reducers 3 to 25 HP.
190—18" Ball Bearing Idlers.
1500' 126C Mall. Roller Chain.
140 Reducers ⅛ to 30 HP.
Wilfley 4" sand pump.
American 4" pump 140' H. 600 gpm.
Whitcomb 10 ton loco. 36" ga.
Yale-Kron crane scale 10,000 lbs.
Jeffrey #224 tripper, automatic.

G. A. UNVERZAGT & SONS INC.
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IMMEDIATE POSSESSION — SUBJECT TO PRIOR SALE

Two Barges, Wooden, Kept in excellent repair, 100' x 24' x 3' ..... $2,000.00—$3,000.00
Steamer James P. Pearson, Towboat & Sand Sucker, coal fired, 200 H.P. sternwheel, wood hull 96' x 23'5" x 4', kept in excellent repair. Coast Guard 1954-55 inspected $7,500.00
Towboat—"Invincible," wood hull 51' x 14' x 3.4', Fairbanks Morse Diesel Model 35F8 ¼, Good Repair, Gross Tonnage 22.5 ..... $5,000.00
Houseboat or Office on Steel Barge, 70' x 16' x 4', with water tank, heater, showers, toilet. Excellent condition $5,000.00
Brownhoist—Locomotive Crane, Serial #9547, 25 ton, 50' boom, never used since overhaul, excellent mechanical, may need some boiler repair $2,500.00
Pioneer Jaw Crusher 9' x 36", PB mounted on 4 steel wheels, Fair condition. Serial #D-603, Parts Book #53872 ..... $800.00
Allis Chalmers #8107, 8" Superior McCully Gyratory Crusher. 1G61930 P-8. Good Condition ..... Make offer
40-45 H.P. Caterpillar Gasoline Power Unit ..... Make offer
Steam Boilers, Off Pump Boat, Twin 225 lb. Pressure, 10—5" Flues x 18', Built in 1936 ..... $1,000.00
Steam Boiler—40" x 18', Mississippi Type, 10—3" flues x 18', 175 lbs. Pressure, Built by Philip Rohan Boiler Co., St. Louis, Missouri. 1925 ..... $500.00
Pump, 8" V-Belt Driven, Complete, Sheave, Fittings, Pipe Connections ..... Make Offer
New Oil, 55 gal. drums, weight unknown, good for outside lubrication and air cleaners ..... $5.00 Per
Empty Drums, 43 ..... $1.00 Per
Stiff Leg Derrick Boom, 63', Lattice Construction $100.00
Spuds, 2—36' x 12" x 12" x ⅝" steel ..... $750.00 Per
Apron Feeder 84" x 30" $1,000.00
¾ yd. Hayward Bucket $250.00
1 yd. Hayward Bucket $300.00
1 Sand Drag $400.00

INQUIRIES WILL RECEIVE OUR PROMPT ATTENTION

Contact: Mr. N. R. Lundeen

MOLINE CONSUMERS COMPANY
MOLINE — Phone 2-5541 — ILLINOIS

USED CRUSHING EQUIPMENT
Diesel Power and Generator

1—18" x 36" Roller Bearing Pioneer Jaw Crusher on skids.

1—36" x 14' Apron Feeder with 3-chain drive, clutch and drive from crusher.

1—Twin Six G.M. Diesel Engine, 260 H.P. continuous rating, on extended steel skids with double outboard bearings and 2 v-belt pulleys.

1—75 KW Generator, with exciter.

1—75 H.P. Slip Ring motor with Starting Equipment.

1—40 x 22 Pioneer Triple Roll Crusher.

1—9' x 22' Winslow Truck Scale.

1—#6, Style K, A C Gates Gyratory Crusher.

Above equipment of our customers in good operating condition is priced to sell.

Call or wire to arrange for inspection.

OSBORNE EQUIPMENT COMPANY
P. O. Box 399 — Knoxville, Tenn.
Phone 5-1177

CRUSHING PLANTS: Pioneer 40V & 48V, CB Pitmaster, Good Roads, Diamond, Pioneer 305W, 880 Univ. 3x12' Univ., 42" x 14' Iowa Apron **FEEDERS. CRUSHERS:** 1218 Acme, 9x36 Wm. 1826 Iowa port. 1624, 1806, 1536 & 2026 CH. 2540 Iowa port. 2042 Buchanan, 4826 Farrell, 4248 & 4860 Traylor JAW. 16, 16, 30 & 36" McCully. 12K Gates, 16R, 20A & 48" Telsmith GYR. 2 & 3' CONE. 1624 Univ. & 1842 Traylor DBL. ROLL. **MILLS:** Marcy 6x12, 6x8, 7x6, 8x3, 6'2, 5A & 3xB Gruendler, 2416 Jeffrey, 4, 5 & Ball OASS Williams, 3603 & 4603 CR Hammer. **DRYERS:** 3x30, 5x40, 6x50, 7x60, 7x110 & 8x120', 10 & 45 ton Plymouth Diesel **LOCOMOTIVES.** 10 & 16' **SEPARATORS. SHOVELS & DRAG:** Koehring 304 & 1005, Lima 604, 802 & 1201. NW 25, 4 & 95. P&H 255, 655 & 1055. Marion 60A, 92, 92M, 300 & 450. Bucyrus 51B, 120B, 170B, 175B. Lorain 820.

Buyer: Bonded Scale and Machine Co.

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8321 Gannon—St. Louis 24, Mo.—Vydeon 1-2226

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FOR SALE

1—150 H.P. Sauerman Slackline Cableway, Electric power, Dual drum hoist, controls; 100 ft. mast, blocks, bridle & bucket carrier, 1½ yd. bucket. All new 1½" and 1¼" guy cables.

Price $4000.00

STATE WASHED SAND & GRAVEL CO.
Station K, Milwaukee 10, Wisconsin
Phone—Sunset 1-9510

IN STOCK
KILNS—COOLERS—DRYERS

10' x 200' x ⅝" comb. chamber, oil & gas burners.
8' x 125' x ⅝" firing hood.
8' x 72' x ⅝".
7' x 110' x 9/16" brick lined.
6' x 74' x ½" with lifters.
5' x 67' x 5/16" with lifters.
5' x 40' x ⅜" with lifters.
4' x 42' x 9/16" brick lined, oil fired.
3' x 16' x ½" brick lined, oil fired.

LINK-BELT ROTO LOUVRES

310-12 with heating coils, cyclone.
502-20 with furnace, collector and fans.
604-24 with furnace or heating coils.
705-20 Stainless contact parts, complete.

PULVERIZERS—MILLS
CRUSHERS

Dixie 36" x 50" Hammermill.
Traylor 18" x 36" Bulldog, Jaw.
Hardinge 10' x 48" Ball Mill, 400 HP.
Patterson 6' x 8' Ball Mills (3 avail.)

SCREENS

Allis Chalmers—4 x 12, 3 x 12 lowhead.
Tyler 4 x 7 with thermonic unit.
Tyler—5 x 12, 3 x 10 wet type.
Link-Belt 3 x 8 double deck.

COMPRESSORS

1500 CFM 100 PSI 300 HP, I.R. FREZ.
1800 CFM 100 PSI 300 HP Bury.
827 CFM 100 PSI 60 HP, I.R. Imperial X
215 CFM 75 PSI 30 HP, I.R.
30 CFM 80 PSI Fuller C11.

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HEAT & POWER CO., INC.
60 EAST 42ND ST., NEW YORK 17, N. Y.
Murray Hill 7-5280
Machinery and Equipment Merchants

SPECIALS

1—Allis-Chalmers 6'x7'x22' two compartment mill and motor.
2—New 6½' x 150' Kilns.
1—New Traylor 5'0" T. Y. Gyratory Crusher.
1—125 HP, 3/60/440V, 450 RPM Squirrel Cage Motor.
1—Complete Lime Hydrating Plant.
1—Complete Plant consisting of 4½'x40' Kiln, 8'x30' Cooler, Supporting Steel Framework, Motors, Fans, Dust Collectors, etc.
1—6 Williams Jumbo hammermill.

KILNS
1—4' x 40', 7' x 120', 8' x 125', 8' x 150' Kilns.

DRYERS
1—4½' x 30', 5½' x 40', 6' x 40', 6' x 60', 8' x 80', 8' x 125'.

CRUSHERS
1—42"x40", 40"x42", 36"x42", 30"x36", 24"x36", 18"x36", 12"x24" Jaw Crushers.
2—42"x16" Allis-Chalmers Crushing Rolls.
1—36"x16" Sturtevant Crushing Rolls.
2—24"x14" Rogers Iron Works Crushing Rolls.
1—24"x12" Farrell Bacon Crushing Rolls.
1—36" Telesmith Gyrosphere Crusher.
1—No. 222, 322 Allis-Chalmers Type "B" Hydrocone Crushers.
1—6", 10", 14", 16" and 20" McCully Superior Gyratory Crushers.
36"—20" Traylor T. Y. Gyratory Crushers. No. 3 up to No. 12 Gyratory Crushers.

BALL, ROD & TUBE MILLS
1—7'x5', 6'x12', 5½'x10', 8'x6' Ball Mills.
2—5'x16'; 1—5½'x10'; 1—6'x12' Rod Mills.
2—5½'x30' Tube Mills.
2—6'x22' Compeb Mills—6'x22' Tube Mills.
1—10'x48", 8'x48", 6'x22" Hardinge Mills.
9—8-Roll Bradley Hercules Mills, Direct Connected to 300 HP Motors.

MISCELLANEOUS
1—8', 14', and 16' Air Separators.
1—6'x4', 12'x10' Oliver Filters.

Have you any machinery that you want to sell?

W. P. HEINEKEN, INC.
50 Broad St., N. Y. Tel. Wh. 4-4236

FOR SALE

1—48" x 60" Traylor Bulldog Jaw Crusher (spare parts also).

2—20" Allis Chalmers Superior McCully Gyratory Crushers (spare parts also).

3—Traylor No. 412 Type TZ Gyratory Crushers.

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INDEX TO WHERE TO BUY

Bacon-Pietsch Co., Inc. 169
Big Rock Stone & Material Co. 170
Bonded Scale & Machine Co. 169
Brill Equipment Co. 170

Corson, G. & W. H., Inc. 173,

Darien 170

Eighmy Equipment Co. 173

Foster, L. B., Co. 171
Frank, M. K. 173

Guion, H. P. 173

Heat & Power Co. 171
Heidenreich, E. Lee, Jr. 173
Heineken, W. P., Inc. 172

Johnson & Hoehler, Inc. 170

Longyear, E. J., Co. 173

McLeod, Alex T. 170, 172
Mid-Continent Equipment Co., Inc. 171
Mississippi Valley Equipment Co. 170, 172
Moline Consumers Co. 171

Neal Gravel Co., Inc. 173
Nelson, N. P., Iron Works Inc. 173
Neuman Sand and Supply Co. 173
New York Trap Rock Corp. 172
Nussbaum Electric Co. 173

O'Neal, Robert E. 173
O'Neill, A. J. 170
Osborne Equipment Co. 171

Pedelty, W. M. 173
Pennsylvania Drilling Co. 173

Smith, H. Y., Co. 173
Smith, L. B., Inc. 170
State Washed Sand & Gravel Co. 171
Stein Equipment Co. 173
Stunts-Yeoman Co. 172
Swabb, Frank, Equipment Co., Inc. 172

Thomasville Drilling & Testing Co. 173
Tractor & Equipment Co. 169

Union Gypsum Co. 173
Unverzagt, G. A., & Sons, Inc. 171

Walsh, Richard P., Co. 169
Weber, Ed 173

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INDEX TO DISPLAY ADVERTISERS

Allis-Chalmers Manufacturing Co. 18, 19, 55, 63, 66, 79
Allis-Chalmers Tractor Division 83
American Brake Shoe Co.
American Manganese Steel Division 6, 107
Amsco Pump Division 6
American Hoist and Derrick Co. 174
American Pulverizer Co. 98

Babcock & Wilcox Co. 69
Baldwin-Lima-Hamilton Corp. 117
Barber-Greene Co. 85
Berg Vault Co. 157
Bergen Machine & Tool Co., Inc. 127
Besser Company 129, 148, 159, 160
Black Brothers Co., Inc. 167
Blaw-Knox Co. 128
Bradley Pulverizer Co. 121
Bucyrus-Erie Co. 73
Butler Bin Co. 126

Caterpillar Tractor Co. ..... 10, 11, 26, Inside Back Cover
Cedar Rapids Block Co. 161
Chain Belt Company 105
Chevrolet Division 97
Chrysler Corporation 112
Clark Equipment Co. 91
Colorado Fuel & Iron Corp. 89, 99
Colorado Iron Works Co. 116
Columbia Machine 165
Combustion Engineering, Inc. 115
Concrete Transport Mixer Co. 153
Cross Engineering Co. 119

Davis, Frank D., Co. 158
Denver Equipment Co. 8
Dodge Trucks 112
Dunn, W. E., Mfg. Co. 147
Dunn Masonry Machinery, Ltd. 147
duPont, E. I., de Nemours & Co., Inc. 61, 111
Dur-O-waL Division 161

Eagle Iron Works 22
Ehrsam, J. B., & Sons Mfg. Co. 120
Erickson Power Lift Trucks, Inc. 160
Euclid Division 77

Falk Corporation 16, 17
Fanning-Schuett Engineering Co. 141
Fuller Company 93

Gardner-Denver Co. 24
General Motors Corp. 77, 97
Gilson Screen Co. 102
Goodrich, B. F., Co. 3
Goodyear Tire & Rubber Co. ..... Back Cover
Gruendler Crusher & Pulverizer Co. 167

Haynes Stellite Co. 20
Hayward Company 116
Hendrick Manufacturing Co. 121
Hough, Frank G., Co. 80, 81
Hyster Company 15

International Harvester Co. 80, 81
Iowa Manufacturing Co. 95

Jaeger Machine Co. 4, 5
Johnson, C. S., Co. 144, 145
Joy Manufacturing Co. 119

Kennedy-Van Saun Mfg. & Engineering Corp. 53
Kent Machine Co. 158
Kirk & Blum Mfg. Co. 156
Koehring Company 144, 145

Laughlin, Thomas, Division 174
LeTourneau-Westinghouse Co. 101, 103
Lima Shovels 117
Link-Belt Co. 1
Littleford Bros., Inc. 160
Ludlow-Saylor Wire Cloth Co. 28

McNally Pittsburgh Manufacturing Corp. 119
Meckum Engineering, Inc. 108
Mine & Smelter Supply Co. 116, 118

Nagle Pumps, Inc. 108
National Conveyor & Supply Co. 154
Nelson, N. P., Iron Works, Inc. 92
Nordberg Mfg. Co. 109

Oliver Corporation 71
Oswalt Engineering Service Corp. 162
Owen Bucket Co. 96

Patterson Foundry & Machine Co. 62
Peabody Engineering Corp. 90
Pettibone Mulliken Corp. 75
Pfarrer, W. H., Co. 167
Portland Cement Association 164
Preco Chemical Corp. 161

Quinn Wire & Iron Works 157

Raymond Division 115
Remington Arms Company, Inc. 61
Research-Cottrell, Inc. 59
Resisto-Loy Co., Inc. 120
Rock Wool Engineering & Equipment Co. 118
Ryerson, Joseph T., & Son, Inc. 102

Schield Bantam Co. 155
Side-O-Matic Unloader Corp. 159
Simplicity Engineering Co. 106
Smidth, F. L., & Co. 12
Smith Engineering Works 21
Smith, T. L., Co. 151
Southeast Ready-Mix 166
Sprague & Henwood, Inc. 104
Standard Dry Kiln Co. 160
Standard Stamping & Perforating Co. 167

Texas Company 32
Thermoid Company 9
Thomas Foundries, Inc. 87
Torrington Company 57
Travel Batcher 166
Traylor Engineering & Mfg. Co. 7

Union Carbide & Carbon Corp. 20
Union Wire Rope Corp. 50, 51
Unit Crane & Shovel Corp. 152
United States Steel Corp. 124
Universal Atlas Cement Co. 124
Universal Engineering Corp. 75
Universal Vibrating Screen Co. 100

Webster Manufacturing, Inc. 65
Westinghouse Air Brake Co. 101, 103
White Motor Co. 130
Wickwire Rope 99
Wilfley, A. R., & Sons, Inc. 104
Willard Concrete Machinery Sales Co. 157
Williams, C. K., & Co. 150
Williams Patent Crusher & Pulverizer Co. ..... Inside Front Cover
Williams, Roger F. 156
Wood, Charles E., Co. 110

Yuba Manufacturing Co. 94

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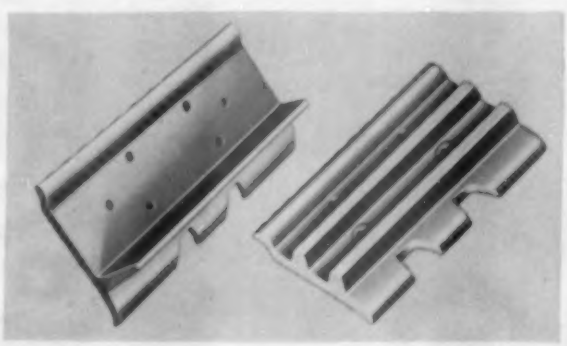

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